5-6675-299-15

TM 5-6675-299-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

THEODOLITE, SURVEYING DIRECTIONAL, 1 MINUTE GRADUATION W/COMPASS AND EXTENSION LEG TRIPOD (KEUFFEL & ESSER MODEL 73 0041 SPECIAL) FSN 6675-832-8649

This copy is a reprint which includes current pages from Change 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1968

D 101.11:

READEX FICHE best copy available

SAFETY PRECAUTIONS

Avoid subjecting the instrument to sudden changes in temperature. Extreme temperature changes may cause internal stresses affecting accuracy and optical components may become fogged.

Severe eye damage can result from performing observations against direct sunlight unless the sun filters are used.

Change in force: C3

*TM 5-6675-299-15
C3

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *16 June 1978*

**Operator, Organizational, Direct Support
General Support and Depot Maintenance Manual
THEODOLITE, SURVEYING, DIRECTIONAL
1 MINUTE GRADUATION, W/COMPASS AND
EXTENSION LEG TRIPOD (KEUFFEL & ESSER
MODEL 73-0041 SPECIAL)
NSN 6675-00-832-4649**

TM 5-6675-299-15, 16 September 1968 is changed as follows:

Cover and title page are changed as shown above.

Page i. After title add the following:

Reporting of Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual, direct to Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MTPS, 4300 Goodfellow Blvd., St. Louis, Missouri 63120. A reply will be furnished directly to you.

Page i. Table of Contents, Appendix A and B are superseded as follows:

APPENDIX A.	References
APPENDIX A-1.	Components of End Items List
APPENDIX B.	Maintenance Allocation Chart
APPENDIX C.	Expendable Supplies and Materials List

Page 1-1. Paragraph 1-1 is superseded as follows:

1-1. Scope.

a. This manual contains instructions for the use of operator, organizational, DS, GS and depot maintenance personnel maintaining the theodolite as allocated by the maintenance allocation chart. It provides information of the operation, lubrication, preventive maintenance services and maintenance of the equipment, its accessories and components.

b. Numbers in parenthesis on illustrations indicate quantity.

Paragraph 1-2 is superseded as follows:

1-2. Forms and Records.

DA Forms and records used for equipment maintenance will be only those prescribed by TM 38-750.

Appendix A is superseded as follows:

*This change supersedes change 2, 24 April 1973.

APPENDIX A
REFERENCES

A-1. MAINTENANCE.

TM 38-750	Army Equipment Record Procedure

A-2. SHIPMENT AND STORAGE

TM 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

Appendix A-1. After Appendix A add Appendix A-1.

APPENDIX A-1
COMPONENTS OF END ITEMS LIST

Section I. INTRODUCTION

1. Scope.

This appendix lists Integral Components of and Basic Issue Items (BII) for the theodolite to help you inventory items required for safe and efficient operation.

2. General.

The components of end item list are divided into the following sections:

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the theodolite and must accompany it whenever it is transferred or turned in. These illustrations will help you identify these items.

b. Section III. Basic Issue Items. These are minimum essential items required to place the theodolite in operation, to operate it and to perform emergency repairs. Although shipped separately packed, they must accompany the theodolite during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII based on Table(s) of Organization and Equipment (TOE)/ Modification Table of Organization and Equipment (MTOE) authorization of the end item.

3. Explanation of Columns.

a. Illustration: This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) *Item Number.* The number used to identify item called out in the illustration.

b. National Stock Number (NSN): Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Part Number (P/N): Indicates the primary number used by the manufacturer which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

d. Description: Indicates the federal item name and if required, a minimum description to identify the item.

e. Location: The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable On Code: Not applicable.

g. Quantity Required (Qty Reqd): This column lists the quantity of each item required for a complete major item.

h. Quantity: This column is left blank for use during inventory. Under the received column, list he quantity you actually receive on your major item. The date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIGURE NO.	(b) ITEM NO.	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
1-3			1882-07 (33363)	Tribrach Assembly			1				
1-1		6675-00-109-6612	1882-01-0025	Sunshade			1				
2-3		6675-00-023-5053	1882-09 (33363)	Case Assembly, Carrying			1				
2-1		6675-00-019-0527	SQ3248 (33363)	Case Assembly, Transportation			1				
2-8		6675-00-019-0455	730215 (33363)	Knapsack			1				
2-7		6675-00-023-5078	5240-1111 (33363)	Case, Battery Assembly			1				
2-7	3	6150-00-113-2924	5240-1136 (33363)	Cable Assembly, Battery Case			1				
2-7	4	6675-00-019-0617	1882-23 (33363)	Lamp Housing Detachable			1				
2-7	2	6675-00-019-0536	2759 (33363)	Lamp Assembly, Hand			1				
2-7	5	6135-00-937-4118	5240-1137 (33363)	Battery, Dummy			2				
2-9		6675-00-641-3572	E46877 (33363)	Tripod Assembly Consisting of:			1				
2-9			No part number	Tripod Assembly			1				
2-9	5		C46244 (33363)	Cap, Tripod Head			1				
2-9	4		B46249 (33363)	Holder, Plumb bob and Wrench			1				
2-9			830000 (33363)	Plumb Bob Assembly			1				
Not called out			A31468 (33363)	Adjuster, Plumb bob			1				
Not illustrated		5120-00-821-9681	W3434-104609	Wrench, Tripod			1				
2-6				Case Accessory, Consisting of:			1				
2-6	15	6675-00-019-0470	D46909-1 (33363)	Case Accessory			1				
2-6	8	6675-00-019-0447	1866-04-02 (33363)	Filter, sun Telescope			1				
2-6	7	6675-00-023-5086	1801-08 (33363)	Eyepiece Assembly Prismatic			1				
2-6	5	6675-00-023-5073	1801-21 (33363)	Compass Assembly, Circular			1				
2-6	3	6675-00-126-8954	74-0635 (33363)	Hood Waterproof			1				

Section III. BASIC ISSUE ITEMS

(1) ILLUSTRATION (a) FIGURE NO.	(b) ITEM NO.	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
				TM 5-6675-299-15, Operator, Organizational, Direct Support, General Support and Depot Maintenance Manual			1				
2-6	13	6675-00-019-0430	5240-1104 (33363)	Pin, Adjusting, small			1				
2-6	12	6675-00-019-0442	5240-1105 (33363)	Pin, Adjusting, large			1				
2-6	11	5120-00-078-2852	5240-1103 (33363)	Screwdriver, jeweler's, large			1				
2-6	10	5120-00-078-2851	5240-1102 (33363)	Screwdriver, jeweler's, small			1				
2-6	1	5120-00-078-2849	5240-1101 (33363)	Screwdriver, Flat Blade			1				
2-6	2	7920-00-205-1427	MIL B43363 (81349)	Brush, Dust			1				
2-6	4	8330-00-965-1722	KK-C-300 (81348)	Chamois			1				
2-8	6	6240-00-954-0124	MS 24515-718AS15 (96906)	Lamp, Incandescent			2				
2-8	6	6240-00-105-8390	5240-1135 (08806)	Lamp, Miniature			2				

After Appendix B add Appendixes C and D.

APPENDIX C
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

1. Scope.

This appendix lists additional items you are authorized for the support of the theodolite.

2. General.

This list identifies items that do not have to accompany the theodolite and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

3. Explanation of Listing.

National stock number, descriptions and quantities are provided to help you identify and request the additional items you require to support this equipment. Usable On codes are not applicable.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	PART NUMBER & FSCM	(2) DESCRIPTION	USABLE ON CODE	(3) U/M	(4) QTY AUTH
6135-00-120-1020		BA30 (81349) Battery, Dry, 1.5 Volts		EA	16

APPENDIX D
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

1. Scope.

This appendix lists expendable supplies and materials you will need to operate and maintain the theodolite. These items are authorized to you by CTA50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

2. Explanation of Columns.

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, Item 5, App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance

c. Column 3 - National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description. Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	7920-00-401-8034	Cloth, Lint free, non-abrasive, General Purpose, Part No. 1001	BX
2	C	9150-00-985-7244	Grease, Instrument and Aircraft (GIA) MIL-G-23827	TU
3	C	9150-00-252-6382	Oil, Clock and Watch OCW 5cc	BT
4	C	6810-00-223-2739	Acetone Technical 1 pt can; Fed Spec MMM-A-185	PT
5	C	6850-00-664-5683	Cleaning Solvent Fed Spec. P-D-680	QT
6	C	6640-00-597-6745	Lens Tissue NNNP40TYPEICLASSI (81349)	PK
7	C	5120-01-018-5908	Orange Sticks 13218E3063 (97403)	PK
8	C	6850-00-680-2233	Desiccant, Activated, 1.5 lb	LB

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J.C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A, Operator maintenance requirements for Surveying Equipment.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CoA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE: 16 DEC 74

PUBLICATION NUMBER	DATE	TITLE
TM5-6115-200-20 AND P	1 APR 72	GENERATOR SET 10 KW NSN 6115-00-231-7286

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.

Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER: JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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FILL IN YOUR UNIT'S ADDRESS

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DATE

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TM 5-6675-299-15	16 SEP 1968	THEODOLITE, SURVEYING, DIRECTIONAL

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

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TM 5-6675-299-15	16 SEP 1968	THEODOLITE, SURVEYING, DIRECTIONAL

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TECHNICAL MANUAL
NO. 5-6675-299-15

TM 9-6675-299-15
HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 16 SEPTEMBER 1968

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL. THEODOLITE, SURVEYING, DIRECTIONAL 1 MINUTE GRADUATION, W/COMPASS AND EXTENSION LEG TRIPOD.

(KEUFFEL & ESSER MODEL 73 0041 SPECIAL)

(FSN 6675-832-8649)

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APPENDIX	B.	MAINTENANCE ALLOCATION		B

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. SCOPE.

a. These instructions are published for use by personnel to whom the Theodolite is issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapters 4, 5 and 6 provide information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components. Organizational, direct and general support and depot maintenance repair parts are listed in TM 5-6675-299-20P and TM 5-6675-299-35P.

Appendix A and B contains the list of basic issue items and the maintenance allocation chart.

b. Numbers in parentheses following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred maintenance sequence.

c. Reporting of Equipment Publication Improvements, DA Form 2028 shall be used for reporting discrepancies and recommendations for improving this equipment publication. The form shall be completed by the individual using the manual and forwarded direct to: Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd, St. Louis, Missouri, 63120.

1-2. RECORD AND REPORT FORMS.

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator or crew, and organizational maintenance, refer to TM 38-750.

Section II. DESCRIPTION AND TABULATED DATA

1-3. DESCRIPTION.

a. Theodolite. The Keuffel & Esser Model 73 0041 Special Theodolite (fig. 1-1, 1-2, 1-3, and 1-4); is a precision, directional-type surveying instrument. It has both azimuth and elevation circle scales, calibrated in degrees for reading the value of angles. Such readings are observed through the microscope eyepiece (fig. 1-3). A micrometer assembly is provided for the interpolation of angle value readings to 1 minute accuracy. A detachable tribrach (fig. 1-3) containing three leveling screws, a circular level, and a base plate is mounted to the horizontal base. The plate is provided with a threaded center to accommodate the tripod locking screw for securing the theodolite on the tripod head.

b. Accessories. The accessories for the theodolite are contained in the accessory case (fig. 2-6) and the battery case (fig. 2-7).

(1) The following items are contained in the accessory case:

(a) Compass (5). The compass is a circular magnetic type that mounts on the theodolite handle. The compass is equipped with a magnifying eyepiece to view the graduations of the compass. The compass mounts on the carrying handle by means of a bracket (5). A compass wrench (14) and spare compass pivots (6) are also contained in the case.

(b) Prismatic Eyepiece Assembly (7). This assembly is a two-prism unit which fits over the eyepieces of the telescope and the microscope. The assembly is used for inclined sights at vertical angles up to 64 degrees. The telescope prism has a slide which is used to introduce a filter for direct observation of the sun.

(c) Filters (8). The telescope sun filter is provided to permit direct observations of the sun.

(d) Tools. Screwdrivers (1, 10, and 11) and adjusting pins (12 and 13) are also provided for adjustment and maintenance of the theodolite. These tools are contained in pouches under the accessory case cover.

(e) Miscellaneous. Also contained in the case are a tube of lubricant (9), cleaning brush (2), chamois (4), and plastic cover (3).

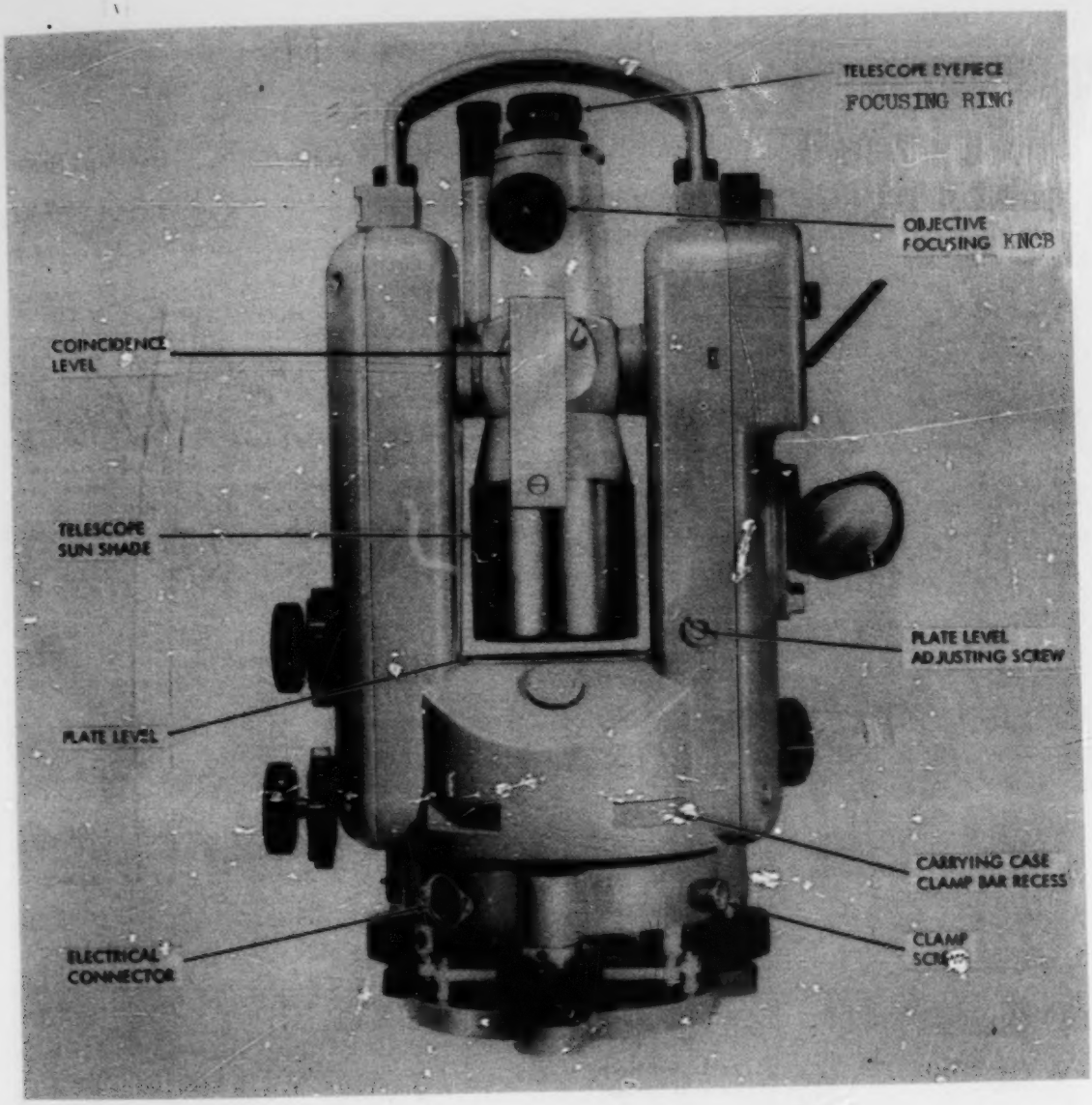


Figure 1-1. Theodolite, front view.

(2) Battery Case. The battery case is a plastic box with a carrying handle that can be mounted on the tripod. The case contains; spare batteries, dummy batteries, spare lamps, cable and receptacle, hand lamp with its cord and connector, lamp housing and a rheostat.

(3) Knapsack. The knapsack is provided for field transport of the theodolite. The canvas knapsack is equipped with shoulder straps and two pockets (fig. 2-8).

1-4. IDENTIFICATION AND TABULATED DATA.

a. Identification. The equipment has the following identification markings:

(1) Theodolite. The manufacturer's name, model, part number and serial number, and the Federal Stock Number are engraved on the left-hand standard.

(2) Carrying Case. The manufacturer's name and part number, and the Federal Stock Number are engraved on the dome of the carrying case.

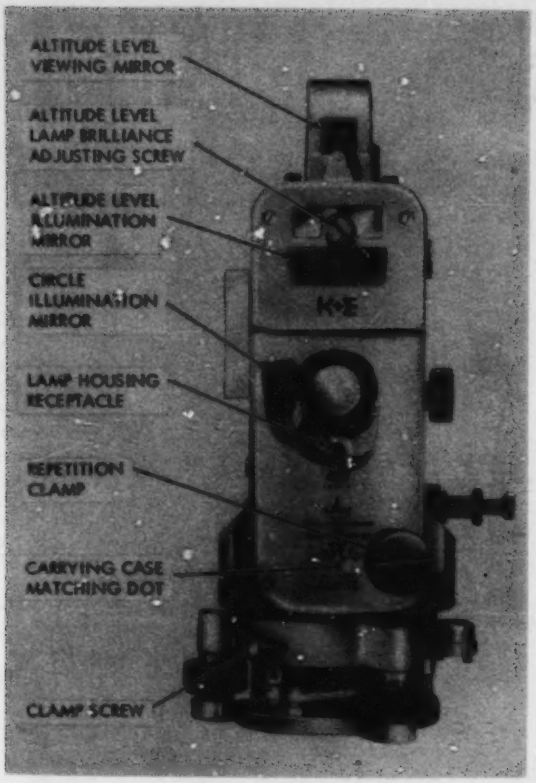


Figure 1-2. Theodolite, left side view.

b. Tabulated Data.

(1) Theodolite.

Manufacturer	Askania-Werke
Model	73 0041 Special
Type	Directional Surveying
Serial number range	674061 through 674121

(2) Telescope.

Magnification	30 x (power)
Minimum Focus	4.8 ft. (feet)
Field of view	26 ft. at 1,000 ft.
Effective aperture	1.75 in., 40 mm (millimeter)

Stadia Lines:

Ratio	1 : 100
Constant	0

(3) Circles:

Diameters:

Azimuth circles	3.5 (inch
Elevation	2.7 in
Divided	360 degree
Direct reading	1'(minute)
Reading by estimation	0.1 min (6 sec.)

(4) Levels.

Sensitivity of plate level	20" (seconds) per 2 mm
Sensitivity of circular level	10' (minutes) per 2 mm
Sensitivity of coincidence level	60" (seconds) per 2 mm

(5) Centering Device.

Centering range of theodolite on tripod	2 in.

(6) Dimensions and Weights.

Theodolite:

Dimensions	6.5 x 5 x 10 in.
Weight	10 lbs. (pounds)

Tripod:

Extended	59 in.
Retracted	36 in.
Weight	12 lbs.

Carrying Case:

Dimensions	8 x 16 in.
Weight	5 lbs.

Transportation case:

Dimensions	12 x 12 x 18 in.
Weight (empty)	6 lbs.

1-5. DIFFERENCE IN MODELS.

This manual covers only the Keuffel & Esser Model 73 0041 Special Theodolite. No known differences exist for the model covered by this manual.

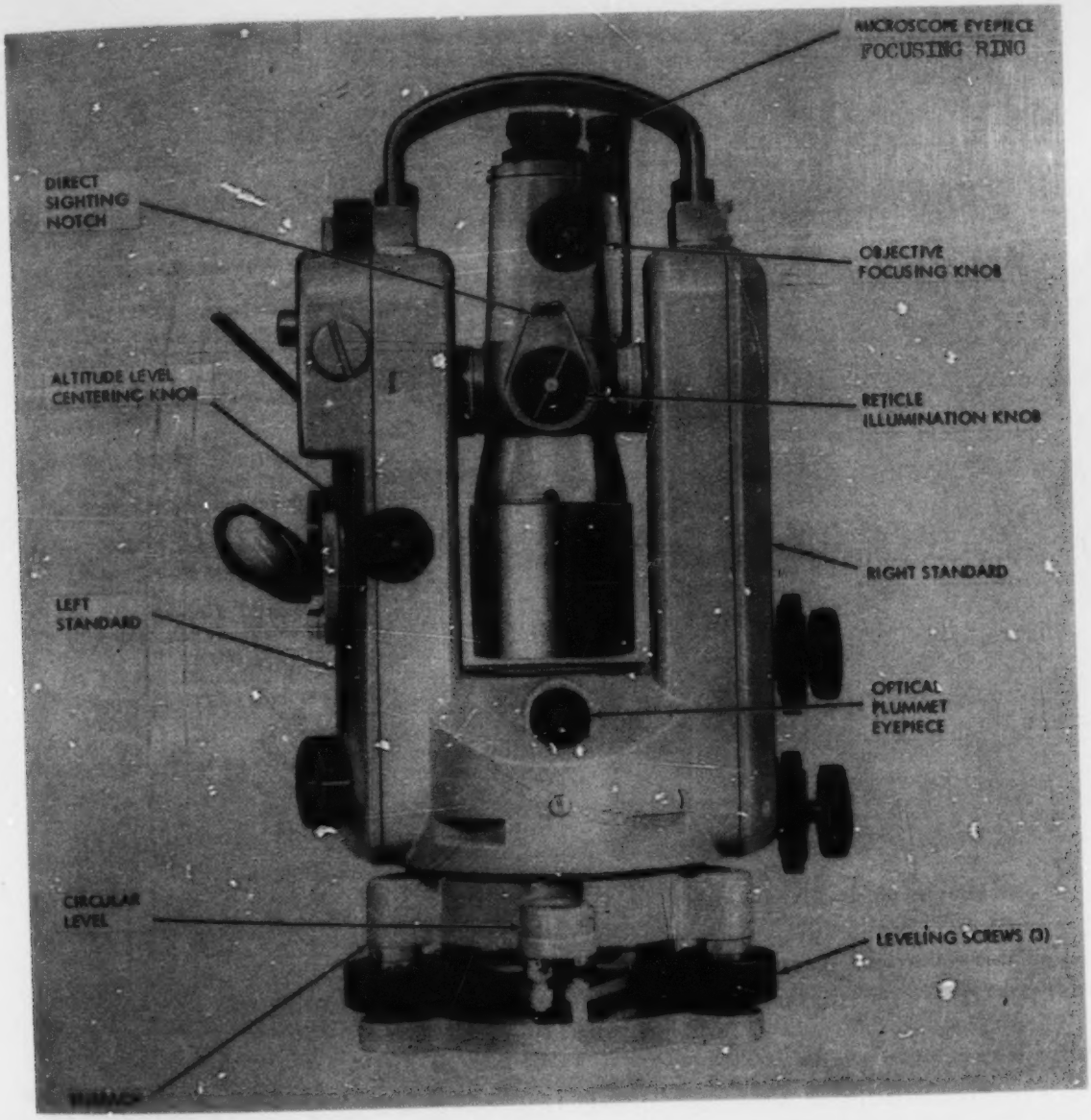


Figure 1-3. Theodolite, rear view.

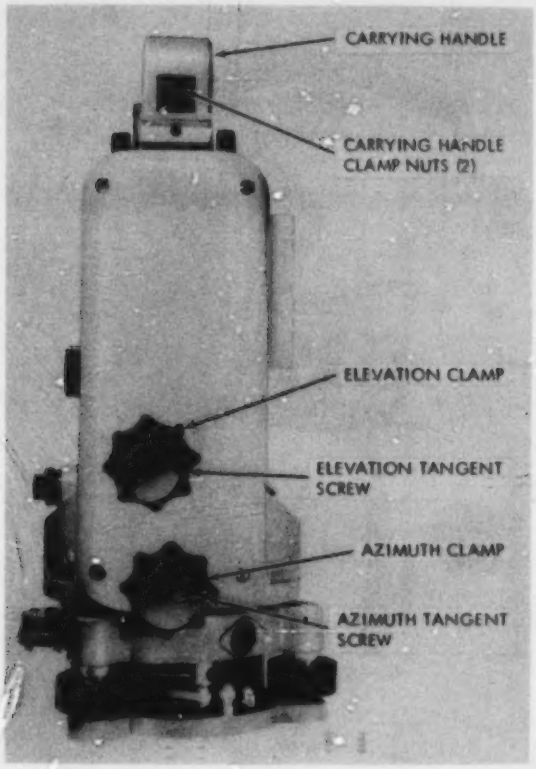


Figure 1-4. Theodolite, right side view.

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. UNLOADING EQUIPMENT.

a. The theodolite and its carrying case are shipped in a plastic transportation case which is encased in a wooden box. The accessory case, battery case, and tripod, are also shipped in the same box. All the items are light enough to be handled without mechanical assistance.

2-2. UNPACKING EQUIPMENT.

a. Theodolite and carrying case.

(1) Open shipping box, remove wrapping material, and lift out transportation case.

(2) Release four latches (fig. 2-1) and lift off transportation case cover.

(3) Remove theodolite carrying case from transportation case (fig. 2-2) and set case on its base.

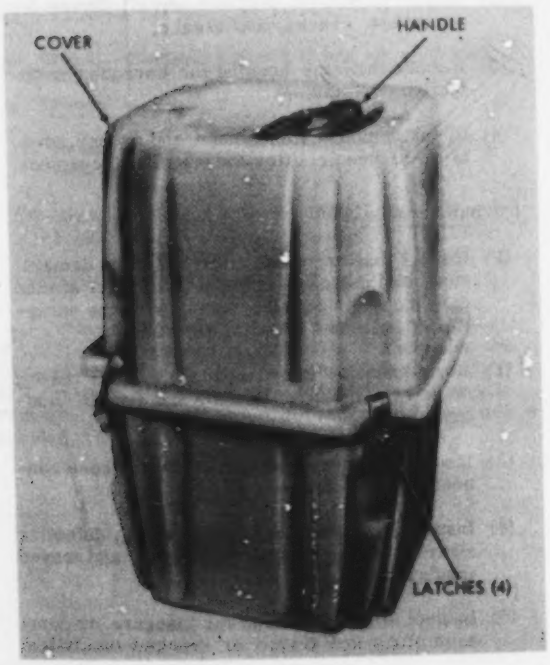


Figure 2-1. Theodolite transportation case.

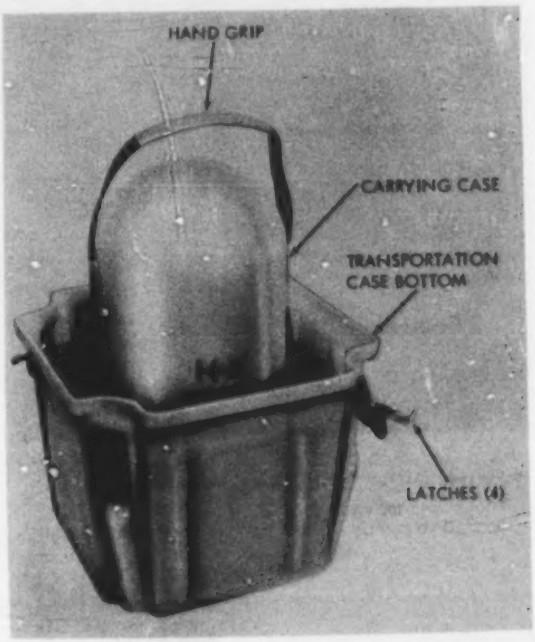


Figure 2-2. Theodolite carrying case, removal and installation.

(4) Refer to figure 2-3 and remove carrying dome.

(5) Refer to figure 2-4 and remove carrying case base.

b. Tripod. Open shipping carton, remove wrapping material, and remove tripod.

c. Accessory case, battery case, and knapsack. Open shipping carton, remove wrapping material, and remove accessory case, battery case, and knapsack.

2-3. INSPECTING AND SERVICING EQUIPMENT.

a. General. Perform the daily preventive maintenance services (par. 3-5).

b. Carrying case.

(1) Inspect carrying case dome and base for dents, cracks, and rust. Inspect clamps and carrying strap of carrying case dome (fig. 2-3) for defects.

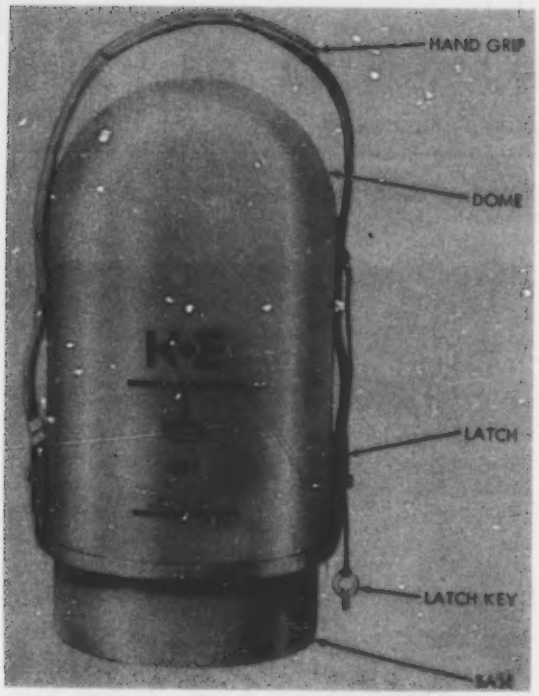


Figure 2-3. Carrying case dome, removal and installation.

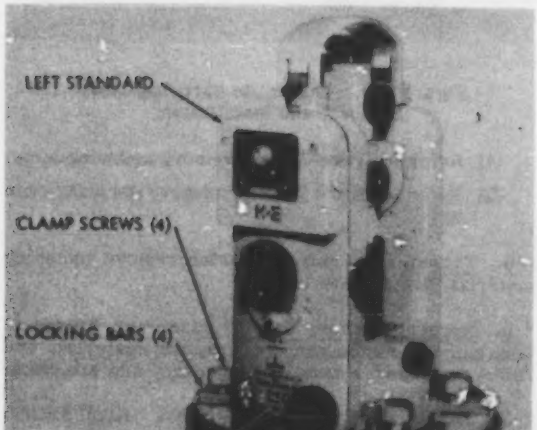


Figure 2-4. Theodolite carrying case base, removal and installation.

(2) Inspect beading in the carrying base (fig.3-5).

(3) Check color of carrying case desiccant.

NOTE: Desiccant should be blue in color. P desiccant indicates moisture saturation must be dehydrated or replaced.

c. Theodolite.

(1) Visually inspect theodolite for broken or mis ing parts, cracked or scratched lenses mirrors, loose or missing hardware, and oth indications of damage.

(2) Inspect all controls for proper operation.

d. Tripod.

(1) Inspect the tripod (fig. 2-5) for damaged missing parts and loose or missing hardwa

(2) Check that plumb bob and tripod wrench contained in holder and are in serviceab condition.

e. Accessory case.

(1) Make certain that accessory case contai components shown in figure 2-6.

(2) Inspect prismatic eyepiece and all filters scratches, cracks, and breaks.

(3) Inspect the lamp housing for corroded or d fective contacts.

(4) Check compass for damage and proper ope ation of needle lifter and magnifying eyepie

f. Battery case.

(1) Inspect battery case (fig. 2-7) for damag rust, and defective clamps. Make certain t case contains all components with the exce tion of batteries shown in figure 2-7.

(2) Turn rheostat knob through its full trav movement should be smooth and free of bin ing.

(3) Inspect all electrical contacts for loose co nections and corrosion.

(4) Inspect hand lamp for broken casing, defecti switch, insecure or damaged plug, and fray insulation.

(5) Inspect electrical cable for insecure or dam aged plugs and frayed or cracked insulatio

g. Knapsack. Inspect knapsack (fig. 2-8) for dam aged straps, insecure or defective buckles, to padding, and tears or cuts.

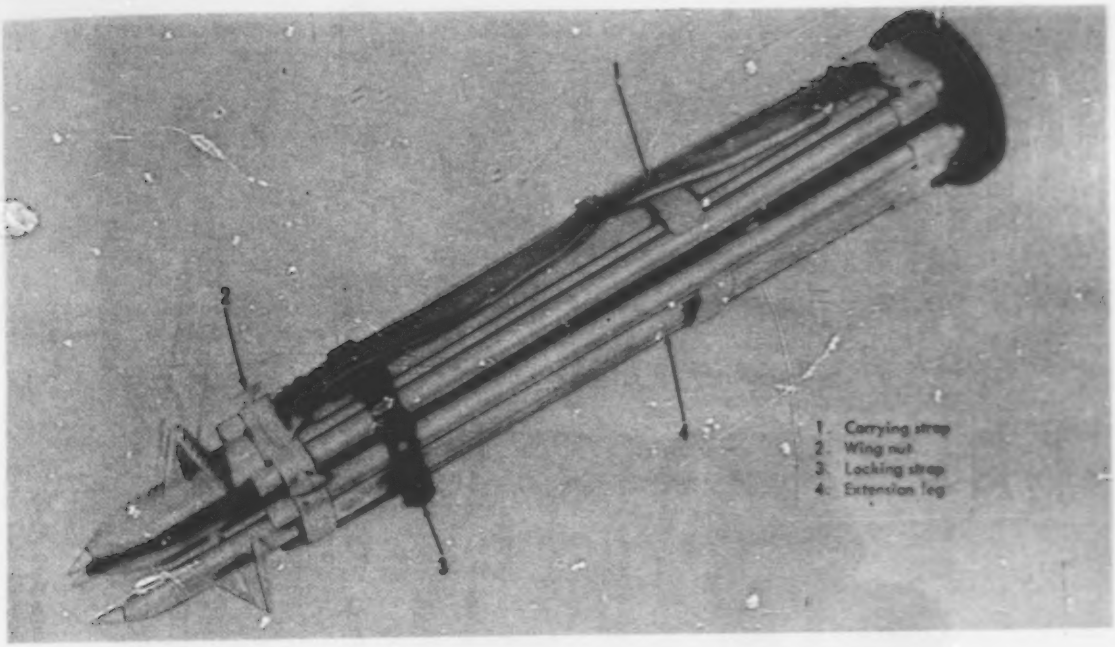


Figure 2-5. Tripod, retracted.

2-4. SETTING-UP INSTRUCTIONS.

a. Tripod. Refer to figure 2-9 and set up tripod.

b. Theodolite.

(1) Remove the theodolite from carrying case (par. 2-2, a.).

(2) Refer to figure 2-9 and install theodolite on tripod.

2-5. EQUIPMENT CONVERSION.

a. General. During night or dark-day operation, the reading circles are illuminated by installing the illumination system which is contained in the battery box. For high-angle observations install the prismatic eyepieces. For direct sun observations, filters are provided.

b. Night or dark-day operations. Refer to figure 2-10 and install the illumination system.

c. High-angle observations.

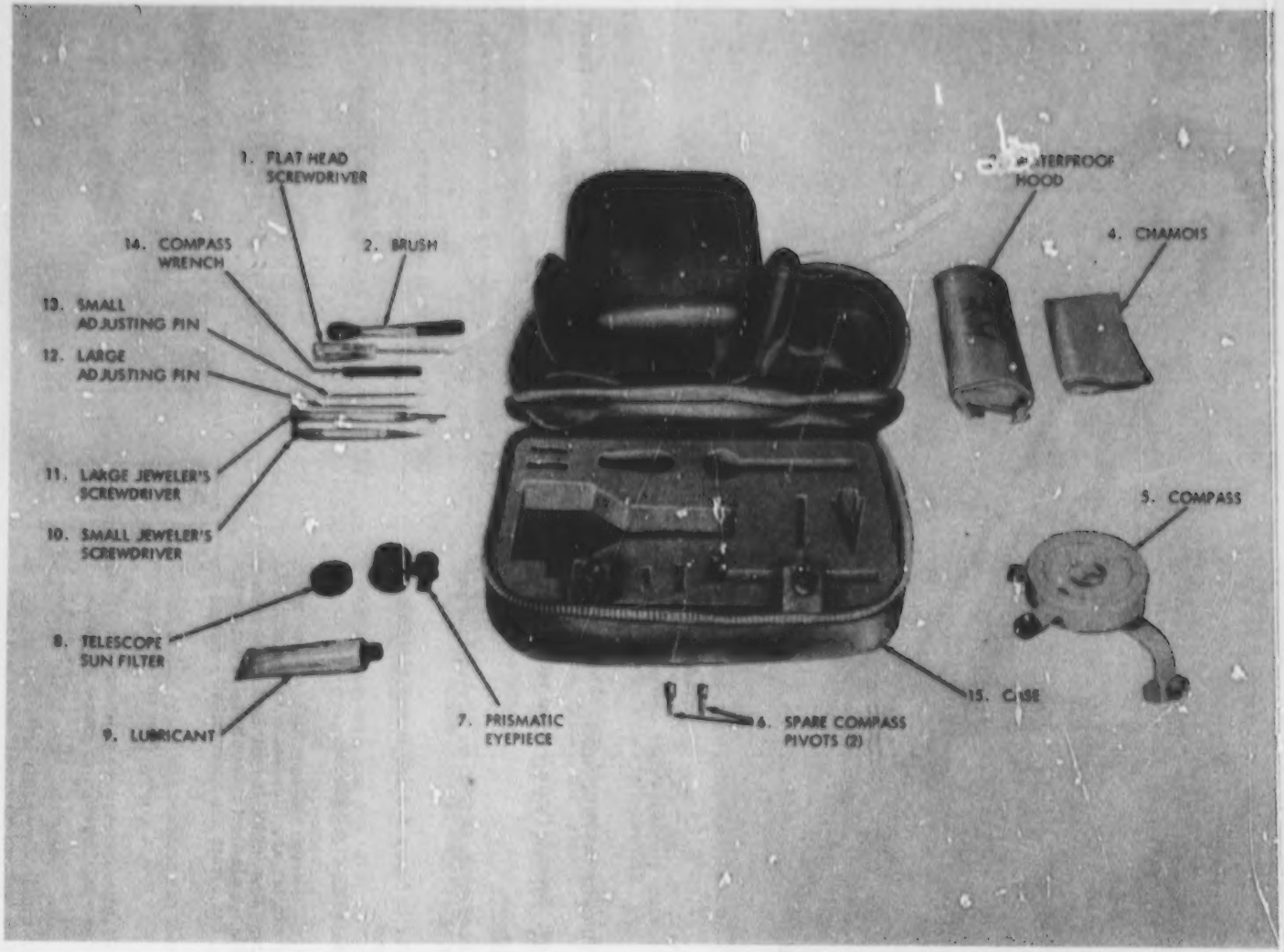
(1) Remove telescope and microscope eyepieces (par. 3-25, a.).

(2) Remove the prismatic eyepiece from accessory case.

(3) Refer to figure 2-11 and install prismatic eyepiece.

WARNING: Severe eye damage can result from performing observations against direct sunlight without utilizing the sun filter.

d. If required, install compass as given in figure 2-12.


1. FLAT HEAD SCREWDRIVER
2. BRUSH
3. WATERPROOF HOOD
4. CHAMOIS
5. COMPASS
6. SPARE COMPASS PIVOTS (2)
7. PRISMATIC EYEPIECE
8. TELESCOPE SUN FILTER
9. LUBRICANT
10. SMALL JEWELER'S SCREWDRIVER
11. LARGE JEWELER'S SCREWDRIVER
12. LARGE ADJUSTING PIN
13. SMALL ADJUSTING PIN
14. COMPASS WRENCH
15. CASE

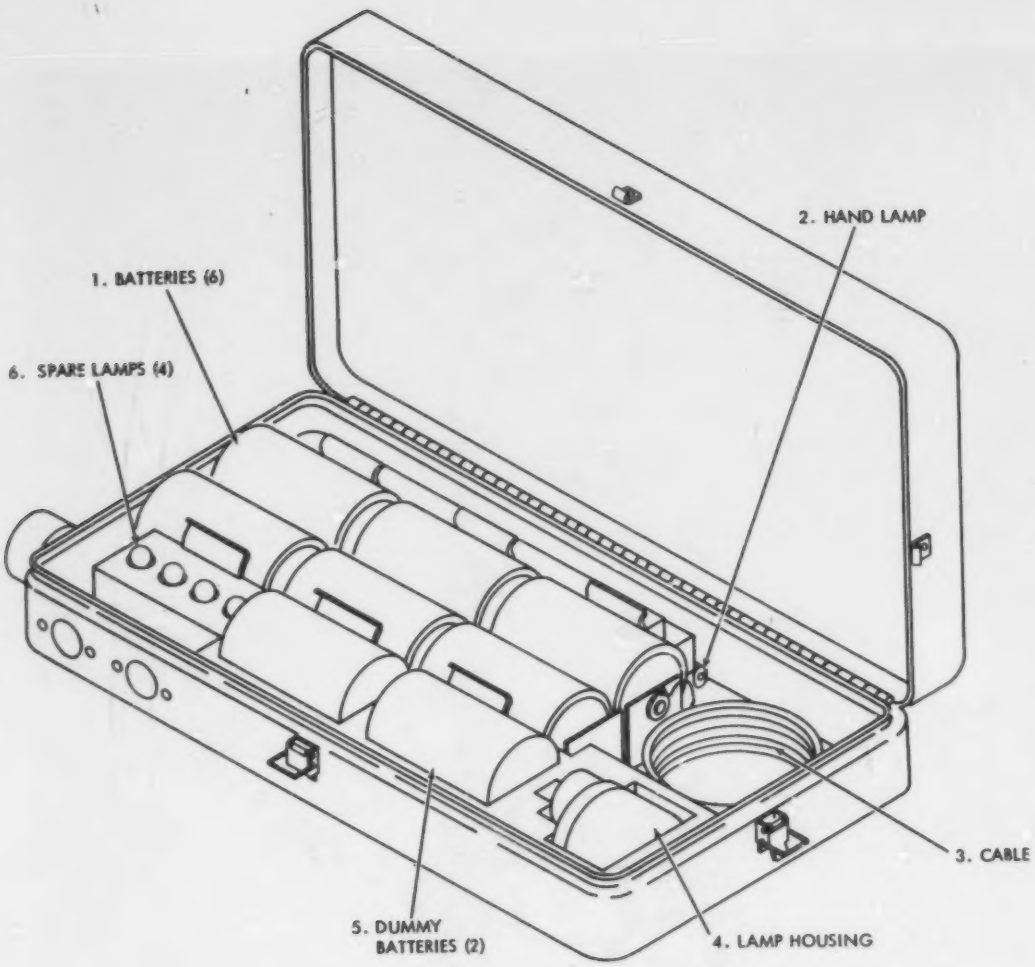


Figure 2-7. Battery case.

Figure 2-8. Knapsack.

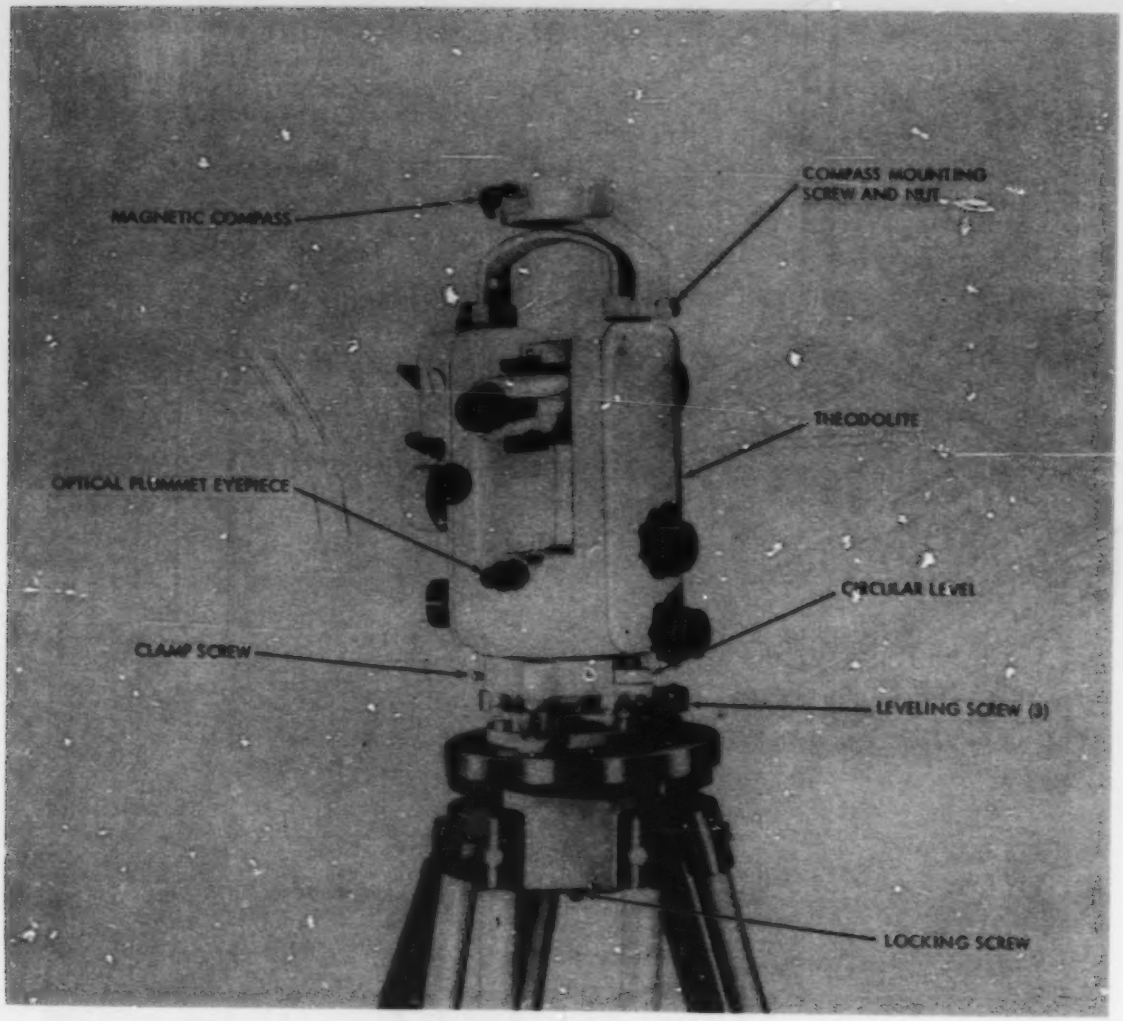


Figure 2-9. Tripod, plumb bob, and theodolite, removal and installation.

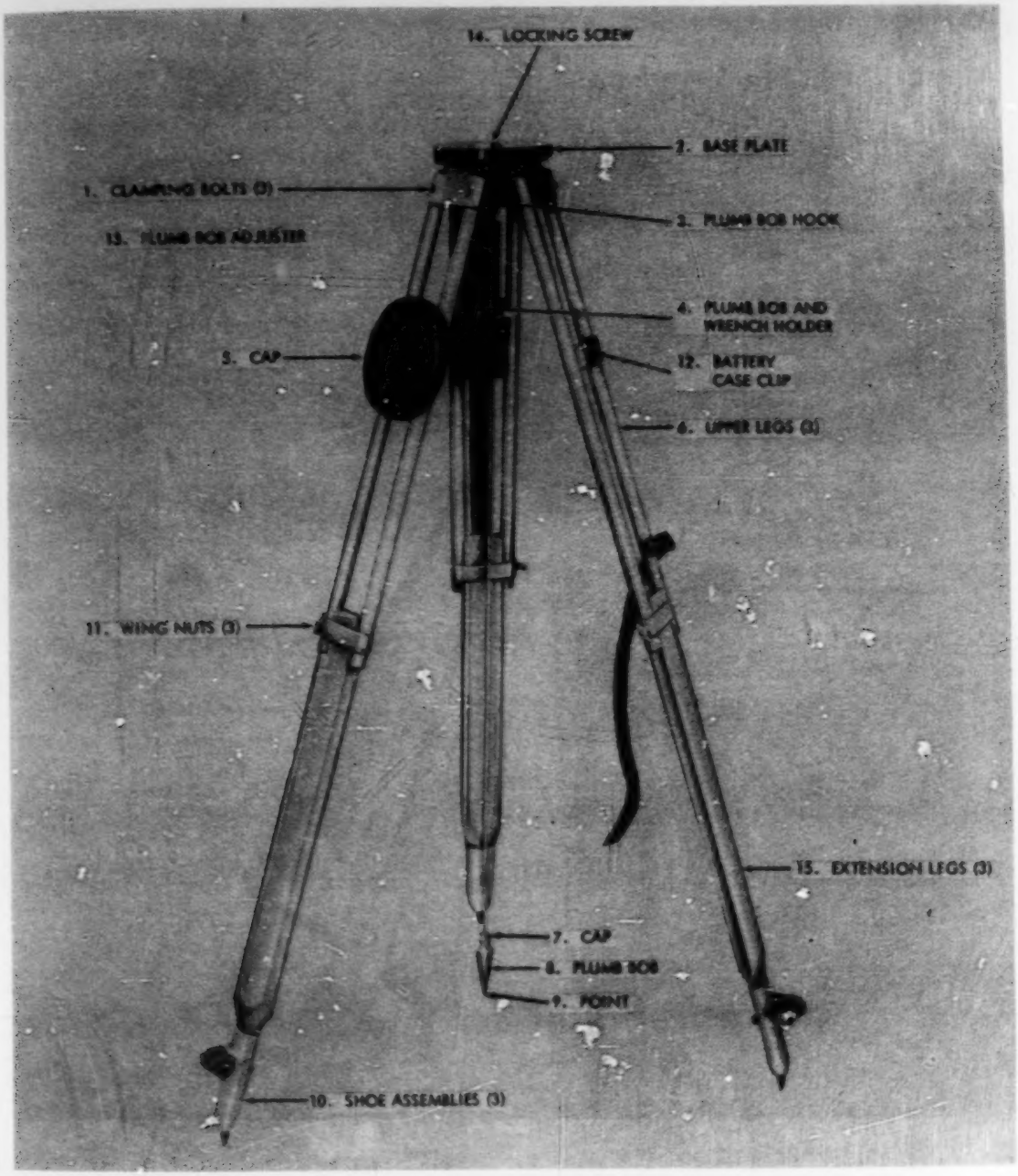


Figure 2-9. Tripod, plumb bob, and theodolite, removal and installation (cont'd).

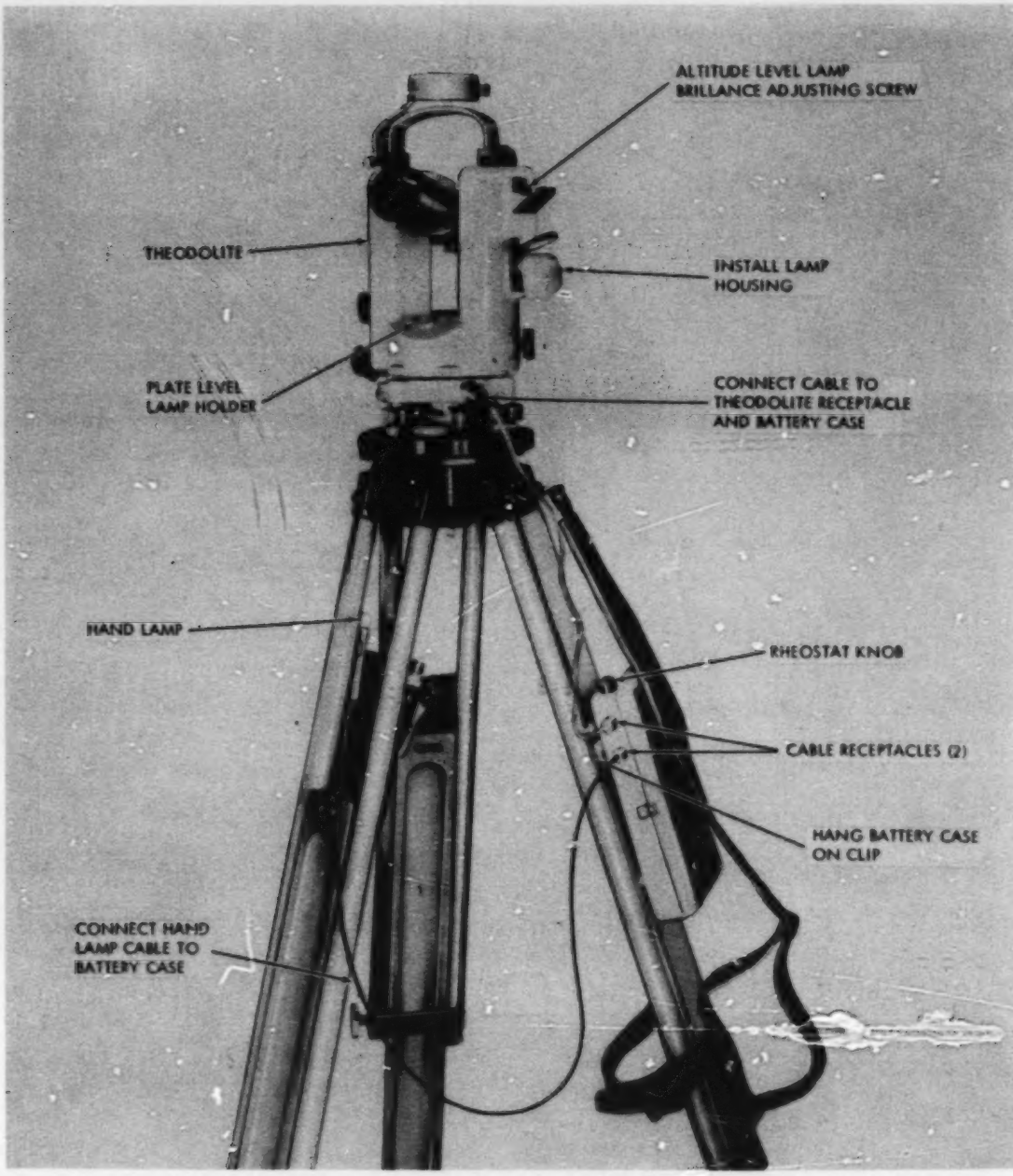


Figure 2-10. Illumination system, removal and installation.

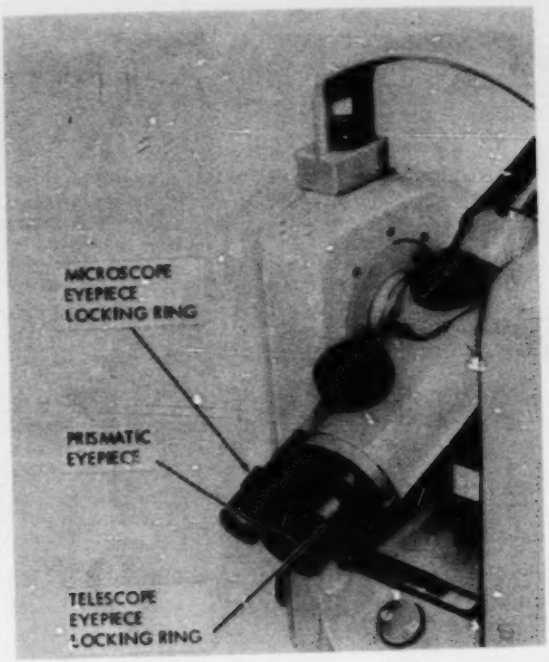


Figure 2-11. Prismatic eyepiece, installation.

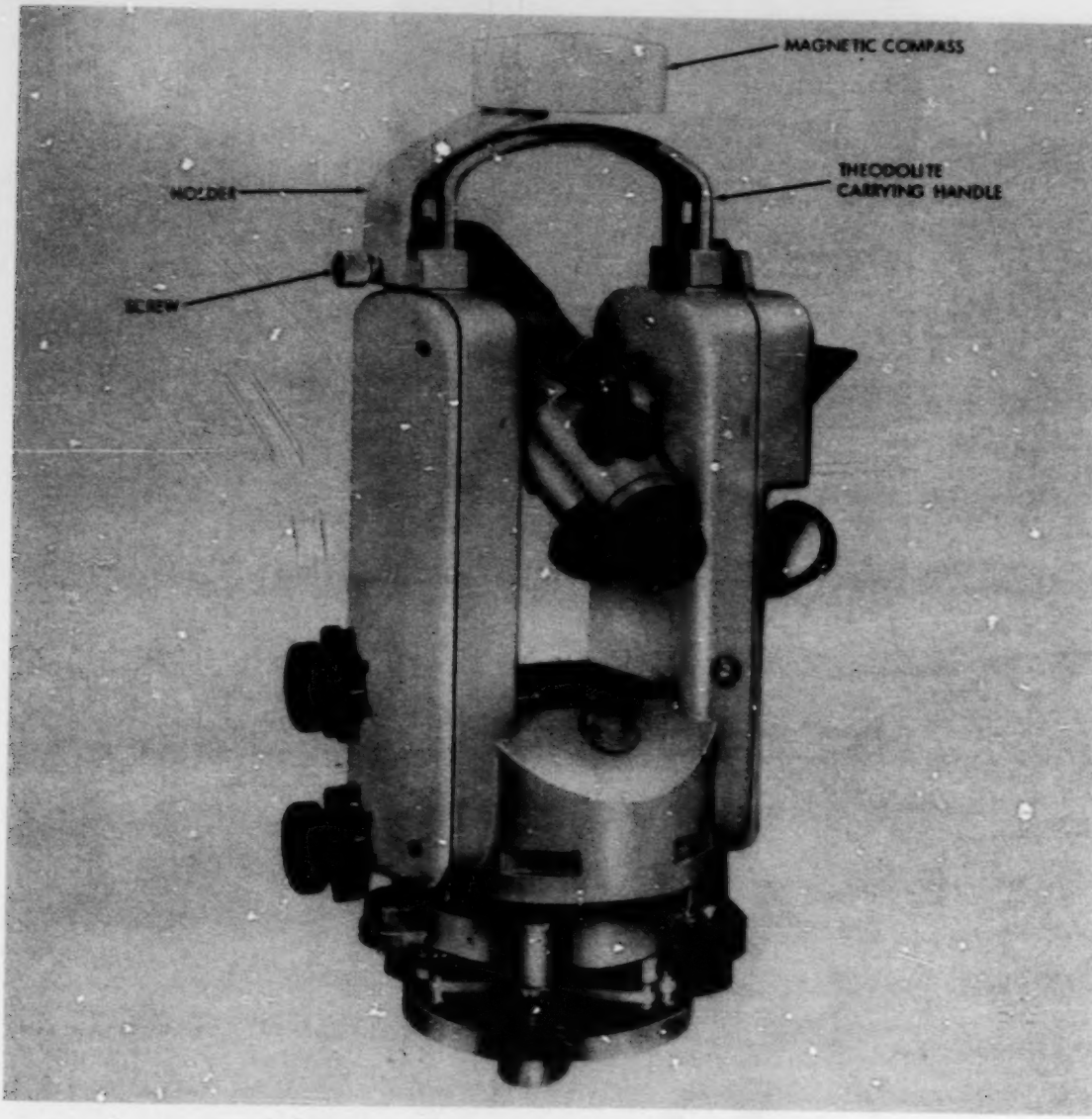


Figure 2-12. Magnetic compass, installation.

Section II. MOVEMENT TO A NEW WORK SITE

2-6. DISMANTLING FOR MOVEMENT.

a. Short distances. For short distances in cleared, level areas, the operator may carry the instrument mounted on the tripod. If the instrument is carried while mounted on the tripod, the operator should not carry it in any position other than upright.

CAUTION: Exercise care when moving the theodolite mounted on tripod. Handle the instrument carefully. Never subject it to bumps, jars, or shocks. Never leave the instrument unattended for long periods of time unless it is returned to the carrying case. Never carry the instrument over the shoulder.

b. Long distances.

(1) When theodolite must be carried for more than a short distance or over rough terrain, instrument should be transported in carrying case (figs. 2-3 and 2-4).

(2) Handle carrying case carefully to avoid sudden jolts, continued vibration, or other shocks that might damage delicate parts of instrument.

(3) If theodolite is to be carried long distances by manpower, knapsack (fig. 2-8) should be utilized.

(4) If the theodolite is to be transported by vehicle for long distances, it should be carried in the transportation case (figs. 2-1 and 2-2).

2-7. REINSTALLATION AFTER MOVEMENT.

Refer to paragraph 2-4 for reinstallation after movement.

Section III. CONTROLS AND INSTRUMENTS

2-8. GENERAL.

This section describes, locates, illustrates, and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for proper operation of the theodolite.

2-9. CONTROLS AND INSTRUMENTS.

The purpose of controls and instruments are illustrated in figure 2-13. The circle and microscope field scales are shown in figure 2-14.

2-10. GENERAL.

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the theodolite.

b. The operator must know how to perform every operation of which the theodolite is capable. This section gives instructions on handling and preparation for operation of the theodolite basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

2-11. ADJUSTMENTS.

a. General. There are two types of adjustments made on the theodolite; instrument and operational. Instrument adjustments bring the theodolite into proper operating condition with respect to the interrelationship of its parts and are not normally accomplished in the field. Operational adjustment bring the theodolite into proper relationship with the terrain being surveyed and are required each time the instrument is set up for use. This paragraph covers instrument adjustment.

b. Pre-adjustment procedure. Before assuming that adjustments are necessary, make sure that the condition of the instrument is causing the apparent lack of adjustment and that the deficiencies noted are not caused by improper testing. To properly test an instrument in the field, proceed as follows:

(1) If possible, choose a cloudy day.

(2) Set up instrument as given in figure 2-9.

(3) Perform all tests in order given. Do not adjust theodolite unless a particular test indicates same amount of error at least three times.

CAUTION: Be on the lookout for "creep", especially when adjusting the levels. After setting a bubble or the line of sight, let it stand for a few seconds to see that no movement occurs.

(4) Perform adjustments in order given so that previous adjustments will not be disturbed.

(5) After each adjustment has been accomplished, perform its applicable test at once.

(6) After required adjustments have been completed, perform all tests in order given to ensure that other adjustments have not been disturbed.

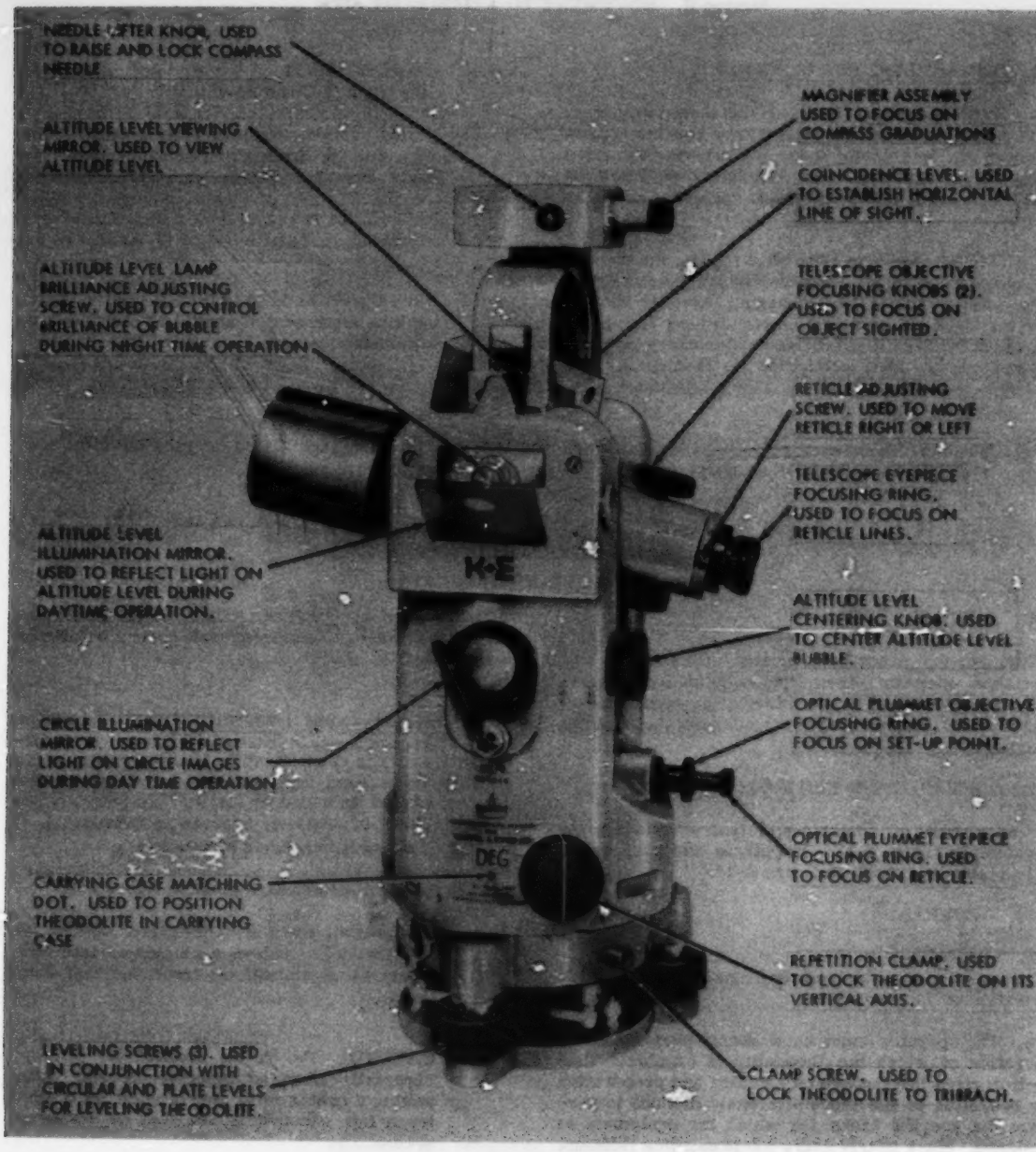

NEEDLE LIFTER KNOB, USED TO RAISE AND LOCK COMPASS NEEDLE
ALTITUDE LEVEL VIEWING MIRROR, USED TO VIEW ALTITUDE LEVEL
ALTITUDE LEVEL LAMP BRILLIANCE ADJUSTING SCREW, USED TO CONTROL BRILLIANCE OF BUBBLE DURING NIGHT TIME OPERATION
ALTITUDE LEVEL ILLUMINATION MIRROR, USED TO REFLECT LIGHT ON ALTITUDE LEVEL DURING DAYTIME OPERATION.
CIRCLE ILLUMINATION MIRROR, USED TO REFLECT LIGHT ON CIRCLE IMAGES DURING DAY TIME OPERATION
CARRYING CASE MATCHING DOT, USED TO POSITION THEODOLITE IN CARRYING CASE
LEVELING SCREWS (3), USED IN CONJUNCTION WITH CIRCULAR AND PLATE LEVELS FOR LEVELING THEODOLITE
MAGNIFIER ASSEMBLY USED TO FOCUS ON COMPASS GRADUATIONS
COINCIDENCE LEVEL, USED TO ESTABLISH HORIZONTAL LINE OF SIGHT.
TELESCOPE OBJECTIVE FOCUSING KNOBS (2), USED TO FOCUS ON OBJECT SIGHTED.
RETICLE ADJUSTING SCREW, USED TO MOVE RETICLE RIGHT OR LEFT
TELESCOPE EYEPIECE FOCUSING RING, USED TO FOCUS ON RETICLE LINES.
ALTITUDE LEVEL CENTERING KNOB, USED TO CENTER ALTITUDE LEVEL BUBBLE.
OPTICAL PLUMMET OBJECTIVE FOCUSING RING, USED TO FOCUS ON SET-UP POINT.
OPTICAL PLUMMET EYEPIECE FOCUSING RING, USED TO FOCUS ON RETICLE.
REPETITION CLAMP, USED TO LOCK THEODOLITE ON ITS VERTICAL AXIS.
CLAMP SCREW, USED TO LOCK THEODOLITE TO TRIBRACH.
K+E
DEG

Figure 2-13. Controls and instruments.

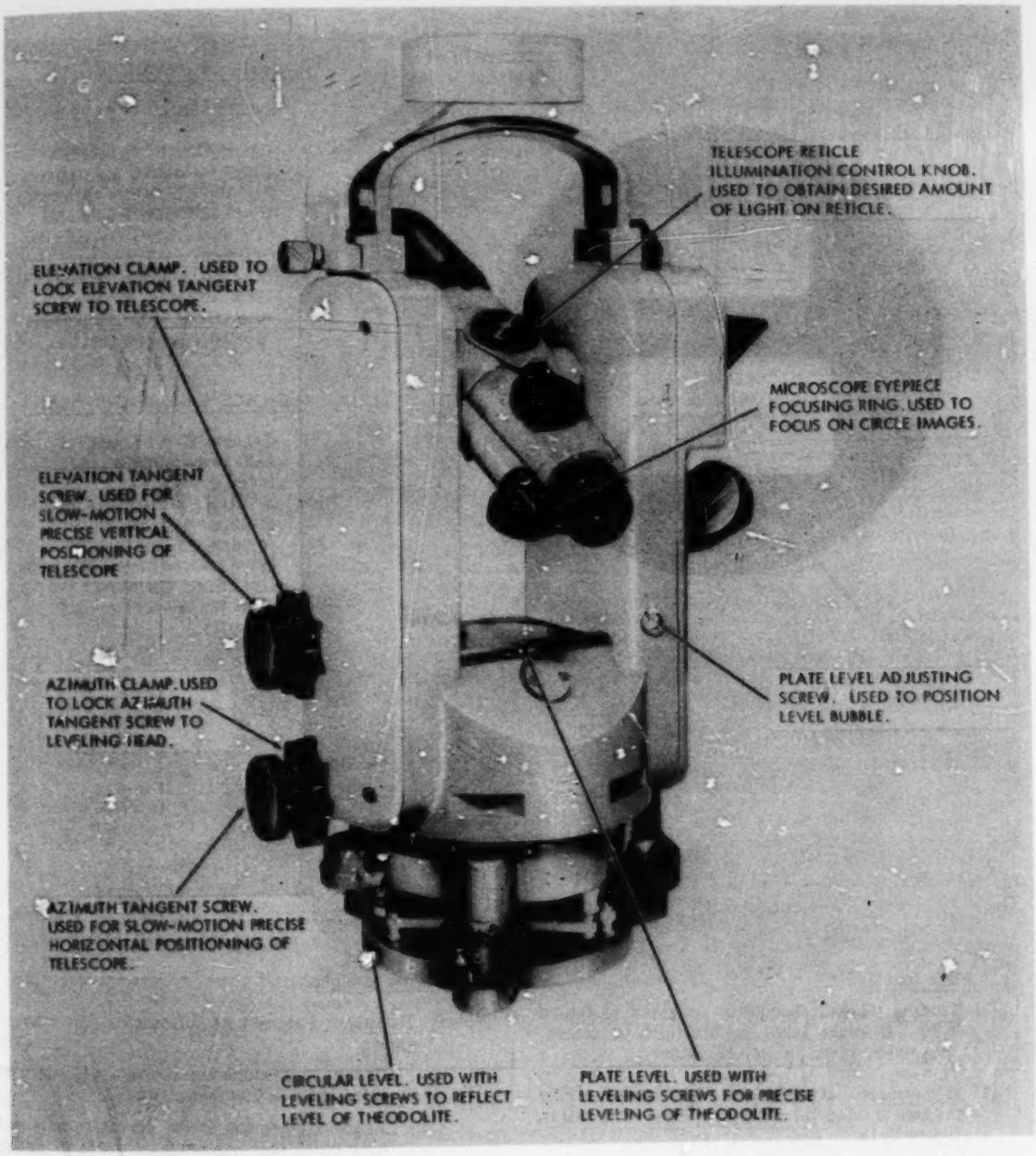
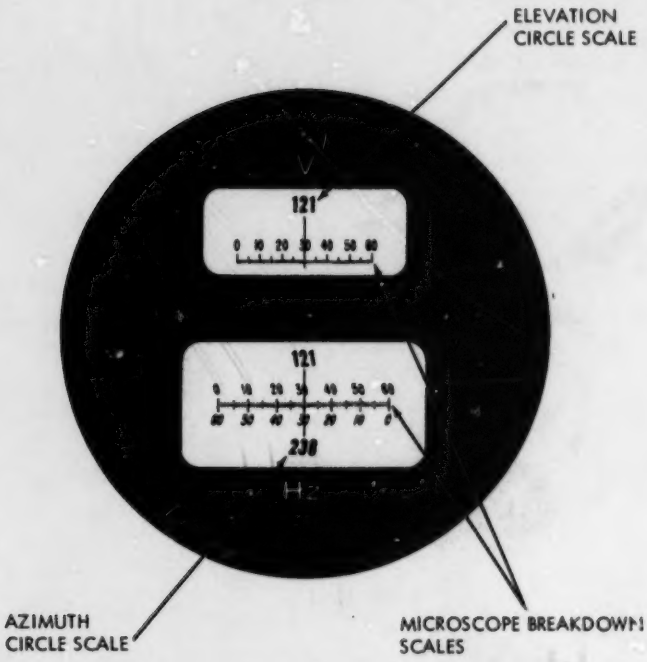

TELESCOPE RETICLE ILLUMINATION CONTROL KNOB. USED TO OBTAIN DESIRED AMOUNT OF LIGHT ON RETICLE.
ELEVATION CLAMP. USED TO LOCK ELEVATION TANGENT SCREW TO TELESCOPE.
MICROSCOPE EYEPIECE FOCUSING RING. USED TO FOCUS ON CIRCLE IMAGES.
ELEVATION TANGENT SCREW. USED FOR SLOW-MOTION PRECISE VERTICAL POSITIONING OF TELESCOPE
AZIMUTH CLAMP. USED TO LOCK AZIMUTH TANGENT SCREW TO LEVELING HEAD.
PLATE LEVEL ADJUSTING SCREW. USED TO POSITION LEVEL BUBBLE.
AZIMUTH TANGENT SCREW. USED FOR SLOW-MOTION PRECISE HORIZONTAL POSITIONING OF TELESCOPE.
CIRCULAR LEVEL. USED WITH LEVELING SCREWS TO REFLECT LEVEL OF THEODOLITE.
PLATE LEVEL. USED WITH LEVELING SCREWS FOR PRECISE LEVELING OF THEODOLITE.

Figure 2-13. Controls and instruments (cont'd).



AZIMUTH OR ELEVATION

CIRCLE SCALE

1. CALIBRATED IN NUMBERED LINES TOTALING 360 DEGREE
2. DISTANCE BETWEEN NUMBERE LINES REPRESENTS 1 DEGREE.
3. FOR MEASURING ANGLES IN DEGREES.
4. EXAMPLE SHOWN REFLECTS 121 DEGREES 30 MINUTES ELEVATION AND 238 DEGREES 30 MINUTES AZIMUTH.

MICROSCOPE BREAKDOWN SCALES

1. CALIBRATED IN NUMBERED AND UNNUMBERED LINES FROM 0 to 60.
2. DISTANCE BETWEEN NUMBERED LINES REPRESENTS 10 MINUTES. DISTANCE BETWEEN UNNUMBERED LINES REPRESENTS 1 MINUTE.
3. USED TO MEASURE ANGLES IN MINUTES.

Figure 2-14. Circle and microscope scales.

c. Plate level.

(1) Testing. Level theodolite as given in figure 2-20. If plate level bubble fails to center, proceed as given in step (2) below.

(2) Adjustment. If bubble failed to center during the test in step (1) above, proceed as given in figure 2-15.

d. Circular Level.

(1) Testing. Level theodolite with plate level as given in figure 2-20. If circular bubble fails to center, proceed as given in step (2) below.

(2) Adjustment. If circular level bubble fails to center after test in step (1) above, proceed as given in figure 2-16.

e. Line of Sight.

(1) Testing. Proceed as follows to test lin sight:

(a) Reverse telescope and aim at a well-def point at least 330 feet away.

(b) Transit telescope on its elevation axis note point that appears on vertical c line at about same elevation and dist as first point.

(c) Turn theodolite in azimuth and aim at or inal point.

(c) Transit telescope on its elevation a Vertical cross line should fall on se point. If it does not, proceed as give step (2) below.

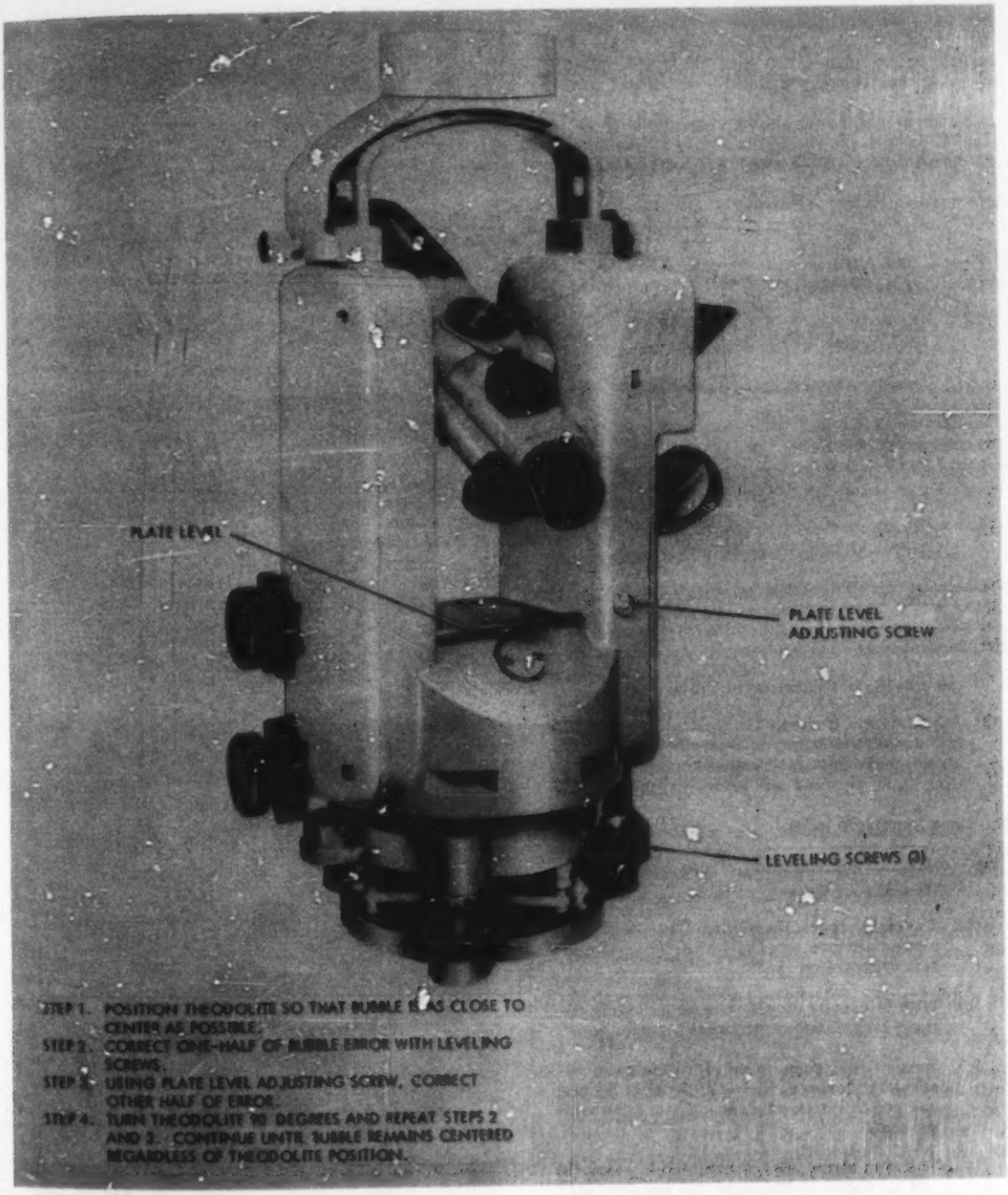


PLATE LEVEL
PLATE LEVEL ADJUSTING SCREW
LEVELING SCREWS (3)
STEP 1. POSITION THEODOLITE SO THAT BUBBLE IS AS CLOSE TO CENTER AS POSSIBLE.
STEP 2. CORRECT ONE-HALF OF BUBBLE ERROR WITH LEVELING SCREWS.
STEP 3. USING PLATE LEVEL ADJUSTING SCREW, CORRECT OTHER HALF OF ERROR.
STEP 4. TURN THEODOLITE 90 DEGREES AND REPEAT STEPS 2 AND 3. CONTINUE UNTIL BUBBLE REMAINS CENTERED REGARDLESS OF THEODOLITE POSITION.

Figure 2-15. Plate level, adjustment.

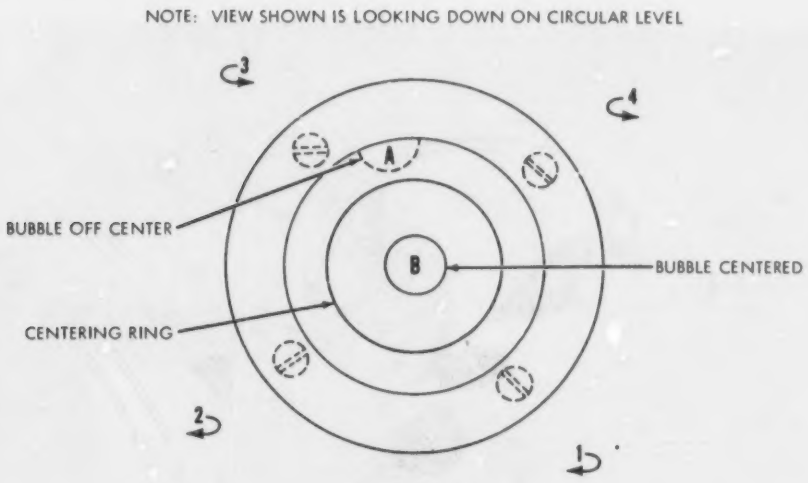

NOTE: VIEW SHOWN IS LOOKING DOWN ON CIRCULAR LEVEL
3
4
A
BUBBLE OFF CENTER
B
BUBBLE CENTERED
CENTERING RING
2
1
STEP 1. TO CENTER BUBBLE FROM POSITION "A" TO POSITION "B" IN EXAMPLE SHOWN, TURN SCREWS IN DIRECTION SHOWN. TURN PAIRS OF DIAGONALLY OPPOSITE SCREWS ALTERNATELY, LOOSENING ONE WHILE TIGHTENING THE OTHER BY THE SAME AMOUNT.
STEP 2. AFTER ADJUSTMENT, CHECK THAT ALL FOUR SCREWS ARE FIRMLY SEATED.

Figure 2-16. Circular level, adjustment.

(2) Adjustment. If vertical cross line failed to fall on second point as described in step (1) above, make sure instrument remains in position, and proceed as given in figure 2-17.

f. Elevation circle index.

(1) Testing. Test elevation circle index as follows:

(a) Carefully level theodolite (fig. 2-20) and center altitude level with altitude level centering knob (fig. 1-3).

(b) With telescope direct, aim on a clearly defined target and record zenith angle.

(c) Transit telescope on its elevation axis, recheck centering of the altitude level bubble, and point on same target. Record the zenith angle.

(d) The sum of the angles obtained in steps (b) and (c) above should equal 360 degrees $\pm$0.1 minute.

(e) If deviation is more than 0.1 minute, perform adjustment given in paragraph (2) below.

(2) Adjustment. Refer to figure 2-18 and adjust elevation circle index.

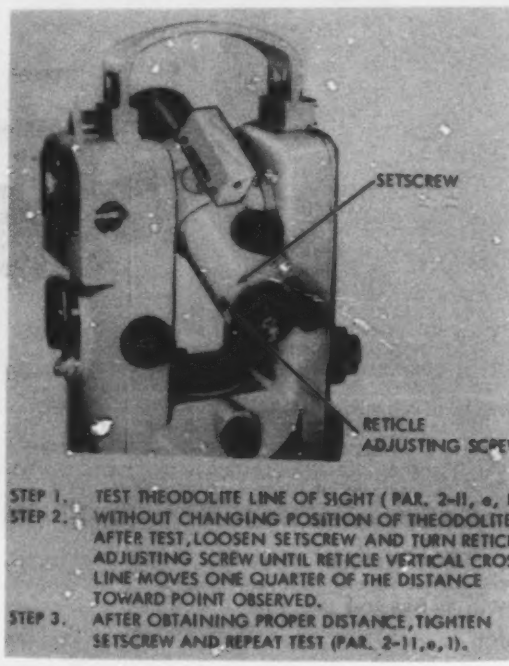

SETSCREW
RETICLE ADJUSTING SCR
STEP 1. TEST THEODOLITE LINE OF SIGHT (PAR. 2-11, e,
STEP 2. WITHOUT CHANGING POSITION OF THEODOLITE
AFTER TEST, LOOSEN SETSCREW AND TURN RETIC
ADJUSTING SCREW UNTIL RETICLE VERTICAL CRO
LINE MOVES ONE QUARTER OF THE DISTANCE
TOWARD POINT OBSERVED.
STEP 3. AFTER OBTAINING PROPER DISTANCE, TIGHTEN
SETSCREW AND REPEAT TEST (PAR. 2-11, e, 1).

Figure 2-17. Line-of-sight, adjustment.

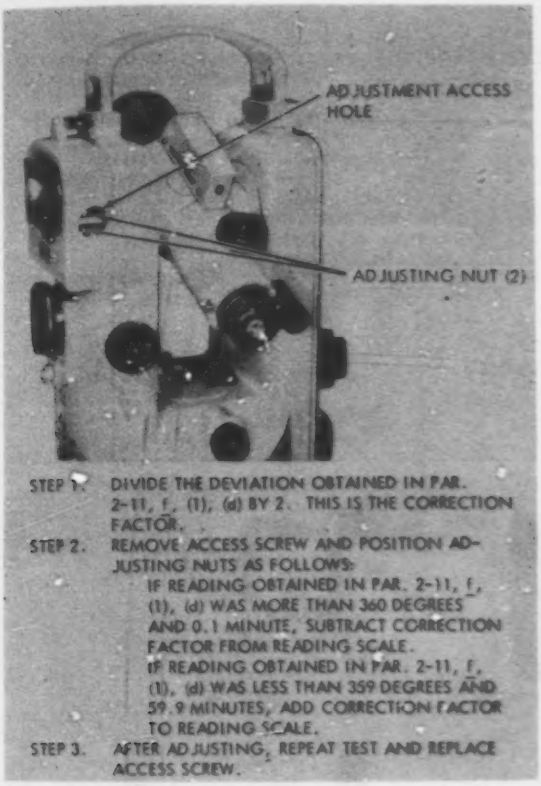

ADJUSTMENT ACCESS HOLE
ADJUSTING NUT (2)
STEP 1. DIVIDE THE DEVIATION OBTAINED IN PAR. 2-11, f, (1), (d) BY 2. THIS IS THE CORRECTION FACTOR.
STEP 2. REMOVE ACCESS SCREW AND POSITION ADJUSTING NUTS AS FOLLOWS:
IF READING OBTAINED IN PAR. 2-11, f, (1), (d) WAS MORE THAN 360 DEGREES AND 0.1 MINUTE, SUBTRACT CORRECTION FACTOR FROM READING SCALE.
IF READING OBTAINED IN PAR. 2-11, f, (1), (d) WAS LESS THAN 359 DEGREES AND 59.9 MINUTES, ADD CORRECTION FACTOR TO READING SCALE.
STEP 3. AFTER ADJUSTING, REPEAT TEST AND REPLACE ACCESS SCREW.

Figure 2-18. Elevation circle index, adjustment.

g. Optical Plummet.

(1) Testing.

(a) Set up theodolite as given in figure 2-9.

(b) Observe station point through optical plummet eyepiece. If station is not centered, proceed as given in paragraph (2) below.

(2) Adjustment. Refer to figure 2-19 and adjust optical plummet.

2-12. OPERATION.

a. Set up theodolite on the tripod (fig. 2-9).

b. Perform necessary daily preventive maintenance procedures (par. 3-5).

c. If desired, install electrical illumination system (par. 2-5, b), as follows:

(1) Adjust rheostat knob (fig. 2-10) until desired amount of brightness is obtained on circle scales.

(2) Adjust reticle illumination control knob (fig. 1-3) until desired amount of brightness is obtained on the telescope reticle.

(3) Adjust altitude level lamp screw until level bubble is adequately illuminated.

d. If electrical illumination system is not required, adjust circle illumination mirror (fig. 1-2) until desired amount of brightness is obtained on circle scales.

e. If desired, install the prismatic eyepiece on the telescope (par. 2-5, c).

WARNING: Severe eye damage can result from performing observations against direct sunlight unless the sun filters are used.

f. Level theodolite (fig. 2-20).

g. Focus telescope as follows:

(1) Direct telescope toward a uniformly light background and adjust telescope eyepiece focusing ring (fig. 1-1) until reticle cross-lines are sharp.

(2) Adjust telescope objective focusing knob (fig. 1-3) until sighted object is clear.

h. Focus microscope by rotating eyepiece focusing ring (fig. 1-3) until circle scales (fig. 2-14) are sharp. The azimuth circle is read in the lower frame marked Hz and the elevation circle reading is presented in the upper frame marked V.

2-13. OPERATION IN EXTREME COLD (BELOW 0° F).

The theodolite and its accessories may be used in extreme cold with no adverse effect on its capabilities. Its use is limited only by the endurance of the operating personnel and conditions affecting visibility.

CAUTION: Avoid subjecting the instrument to sudden changes in temperature. Extreme temperature changes may cause internal stresses affecting accuracy and optical components may become fogged.

2-14. OPERATION IN EXTREME HEAT.

If the theodolite is operated in extreme heat and under the direct rays of the sun, internal stresses and distortion may occur which would result in poor sightings. If possible, the theodolite should be protected from the sun by a surveyor's field umbrella or other suitable means. Taking sightings during early morning or late evening will help to minimize error magnitude. Also, shorter sightings will decrease the amount of sighting error. If the theodolite is kept in a cool storage area, it should be removed from storage in sufficient time before use to allow the temperature of the instrument to approach that of the outside air.

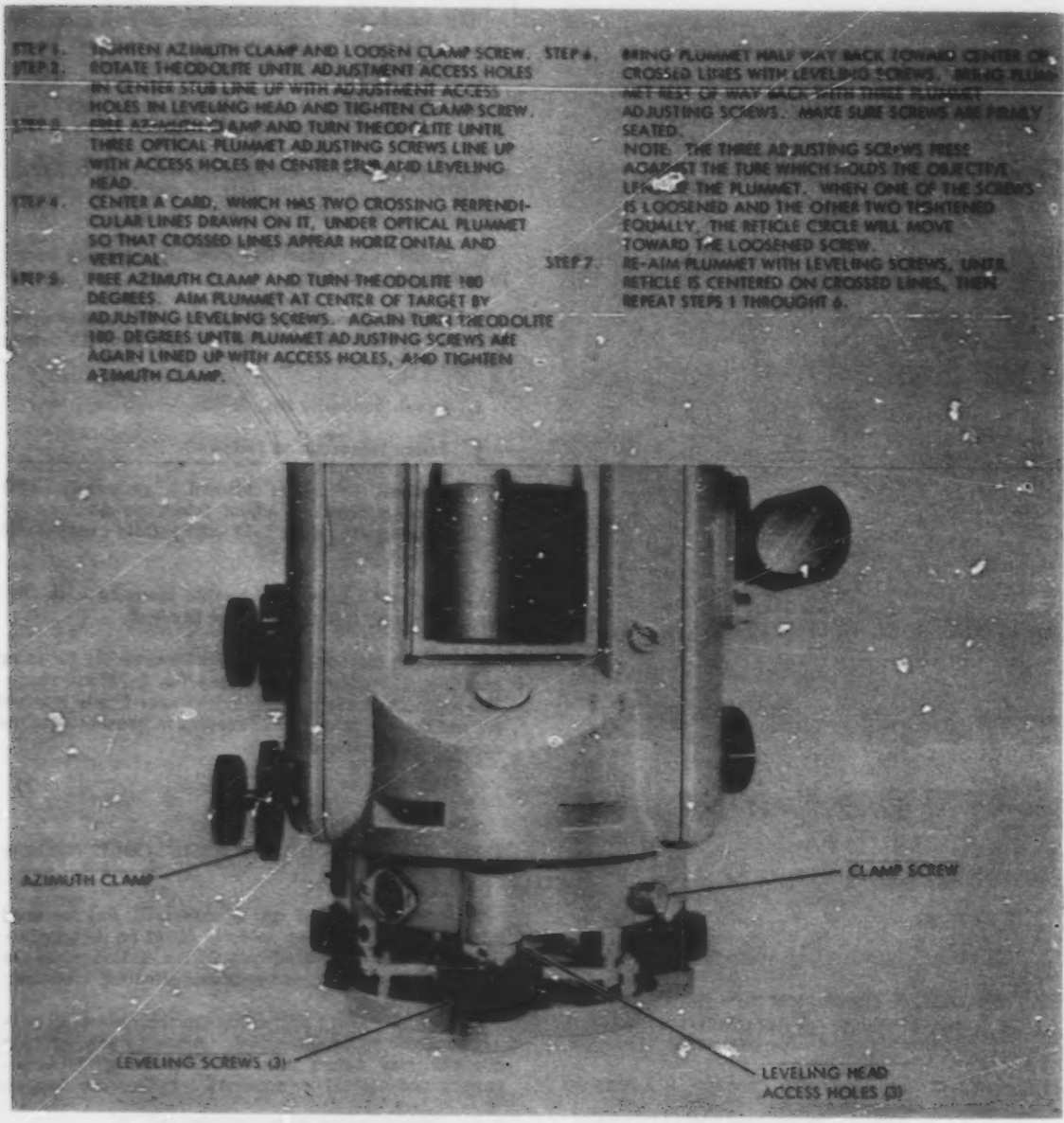

STEP 1. TIGHTEN AZIMUTH CLAMP AND LOOSEN CLAMP SCREW.
STEP 2. ROTATE THEODOLITE UNTIL ADJUSTMENT ACCESS HOLES IN CENTER STUB LINE UP WITH ADJUSTMENT ACCESS HOLES IN LEVELING HEAD AND TIGHTEN CLAMP SCREW.
STEP 3. FREE AZIMUTH CLAMP AND TURN THEODOLITE UNTIL THREE OPTICAL PLUMMET ADJUSTING SCREWS LINE UP WITH ACCESS HOLES IN CENTER STUB AND LEVELING HEAD.
STEP 4. CENTER A CARD, WHICH HAS TWO CROSSING PERPENDICULAR LINES DRAWN ON IT, UNDER OPTICAL PLUMMET SO THAT CROSSED LINES APPEAR HORIZONTAL AND VERTICAL.
STEP 5. FREE AZIMUTH CLAMP AND TURN THEODOLITE 180 DEGREES. AIM PLUMMET AT CENTER OF TARGET BY ADJUSTING LEVELING SCREWS. AGAIN TURN THEODOLITE 180 DEGREES UNTIL PLUMMET ADJUSTING SCREWS ARE AGAIN LINED UP WITH ACCESS HOLES, AND TIGHTEN AZIMUTH CLAMP.
STEP 6. BRING PLUMMET HALF WAY BACK TOWARD CENTER OF CROSSED LINES WITH LEVELING SCREWS. BRING PLUMMET REST OF WAY BACK WITH THREE PLUMMET ADJUSTING SCREWS. MAKE SURE SCREWS ARE FIRMLY SEATED.
NOTE: THE THREE ADJUSTING SCREWS PRESS AGAINST THE TUBE WHICH HOLDS THE OBJECTIVE LENS OF THE PLUMMET. WHEN ONE OF THE SCREWS IS LOOSENED AND THE OTHER TWO TIGHTENED EQUALLY, THE RETICLE CIRCLE WILL MOVE TOWARD THE LOOSENED SCREW.
STEP 7. RE-AIM PLUMMET WITH LEVELING SCREWS, UNTIL RETICLE IS CENTERED ON CROSSED LINES, THEN REPEAT STEPS 1 THROUGHT 6.
AZIMUTH CLAMP
CLAMP SCREW
LEVELING SCREWS (3)
LEVELING HEAD ACCESS HOLES (3)

Figure 2-19. Optical plummet, adjustment.

2-15. OPERATION IN DUSTY OR SANDY AREAS.

Special precautions must be observed when the theodolite is used in a dusty or sandy environment as dust and sand are highly abrasive. If foreign matter adheres to mating surfaces, the mechanisms may bind. The instrument should be frequently brushed and wiped clean. Use extreme care to avoid scratching any of the optics surfaces while cleaning. Protect the theodolite from blowing dust and sand. Always place a protective cover over the instrument when it is not in use.

2-16. OPERATION UNDER RAINY OR HUMID CONDITIONS. In spite of its enclosed construction, the theodolite is not waterproof. In humid areas, a drop in temperature may cause condensate to fog the lenses and prisms. Internal fogging can usually be removed by placing the theodolite in a warm dry environment. External condensation may be removed using the

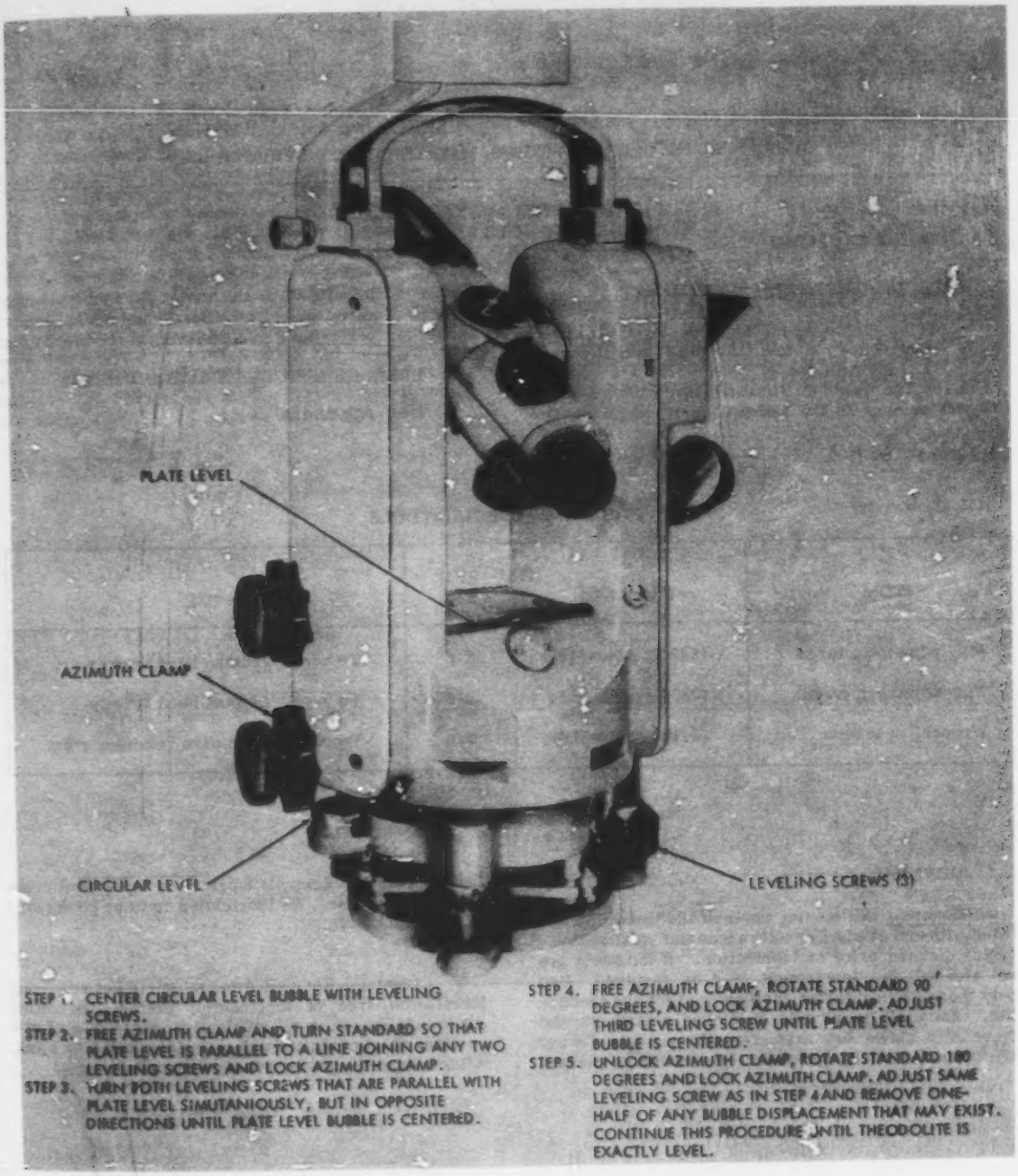


PLATE LEVEL
AZIMUTH CLAMP
CIRCULAR LEVEL
LEVELING SCREWS (3)
STEP 1. CENTER CIRCULAR LEVEL BUBBLE WITH LEVELING SCREWS.
STEP 2. FREE AZIMUTH CLAMP AND TURN STANDARD SO THAT PLATE LEVEL IS PARALLEL TO A LINE JOINING ANY TWO LEVELING SCREWS AND LOCK AZIMUTH CLAMP.
STEP 3. TURN BOTH LEVELING SCREWS THAT ARE PARALLEL WITH PLATE LEVEL SIMUTANIOUSLY, BUT IN OPPOSITE DIRECTIONS UNTIL PLATE LEVEL BUBBLE IS CENTERED.
STEP 4. FREE AZIMUTH CLAMP, ROTATE STANDARD 90 DEGREES, AND LOCK AZIMUTH CLAMP. ADJUST THIRD LEVELING SCREW UNTIL PLATE LEVEL BUBBLE IS CENTERED.
STEP 5. UNLOCK AZIMUTH CLAMP, ROTATE STANDARD 180 DEGREES AND LOCK AZIMUTH CLAMP. ADJUST SAME LEVELING SCREW AS IN STEP 4 AND REMOVE ONE-HALF OF ANY BUBBLE DISPLACEMENT THAT MAY EXIST. CONTINUE THIS PROCEDURE UNTIL THEODOLITE IS EXACTLY LEVEL.

Figure 2-20. Theodolite, leveling.

chamois. During rainfall, protect the instrument with a surveyor's field umbrella; and between periods of use while it is set up on the tripod, cover it with the waterproof hood. If the theodolite is wet, do not keep it in the carrying case any longer than necessary. As soon as possible remove the instrument and do not return it to the case until it is completely dry.

2-17. OPERATION IN SALT-WATER AREAS. Salt is highly corrosive to metal. If using the theodolite in salt-water areas, wipe it frequently with the chamois. If salt-water contacts the instrument, the exterior should be thoroughly cleaned. As soon as possible, return the instrument to direct and general support maintenance.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

3-1. SPECIAL TOOLS AND EQUIPMENT.

The special tools required to perform organizational maintenance on the theodolite are listed in Table 3-1. Illustrations of these tools are listed in the table. The five-digit number in parenthesis above the part number is the Federal Supply Code number for the manufacturer of the tool. No special equipment is required by organizational maintenance personnel for performing maintenance on the theodolite.

3-2. BASIC ISSUE TOOLS AND EQUIPMENT.

See Appendix B

TABLE 3-1. SPECIAL TOOLS

ITEM	PART NO.	REF FIG	USE
Pin, adjusting, large	(33363) 5240-1105	2-6	To adjust capstan head screws
Pin, adjusting, small	(33363) 5240-1104	2-6	To adjust capstan head screws
Wrench, spanner	(94108) 1874-1005	2-6	To remove compass retaining ring.

Section II. LUBRICATION

3-3. GENERAL.

a. General. All moving parts of the theodolite are fitted with extremely fine tolerances and must be thoroughly cleaned prior to lubrication. If the parts are not cleaned, the instrument may be damaged. Use only those lubricants that are approved for the theodolite. Keep all lubricants in closed containers and store in a clean, dry area away from heat. Do not allow dust, dirt, or other foreign matter to contact the lubricants. Keep all lubrication equipment clean and ready for use. No lubrication is to be performed in the field.

b. Cleaning. Keep all external parts not requiring lubrication, free of lubricants. Before lubricating the theodolite, wipe all lubrication points free of dirt or other foreign matter using a clean lint-free cloth. After lubricating, wipe off any excess lubricant.

Section III. PREVENTIVE MAINTENANCE SERVICES

3-4. GENERAL.

To insure that the theodolite is ready for operation at all times, it must be inspected systematically so that the defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-5 and 3-6. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. All difficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 at the earliest possible opportunity.

3-5. DAILY PREVENTIVE MAINTENANCE SERVICES.

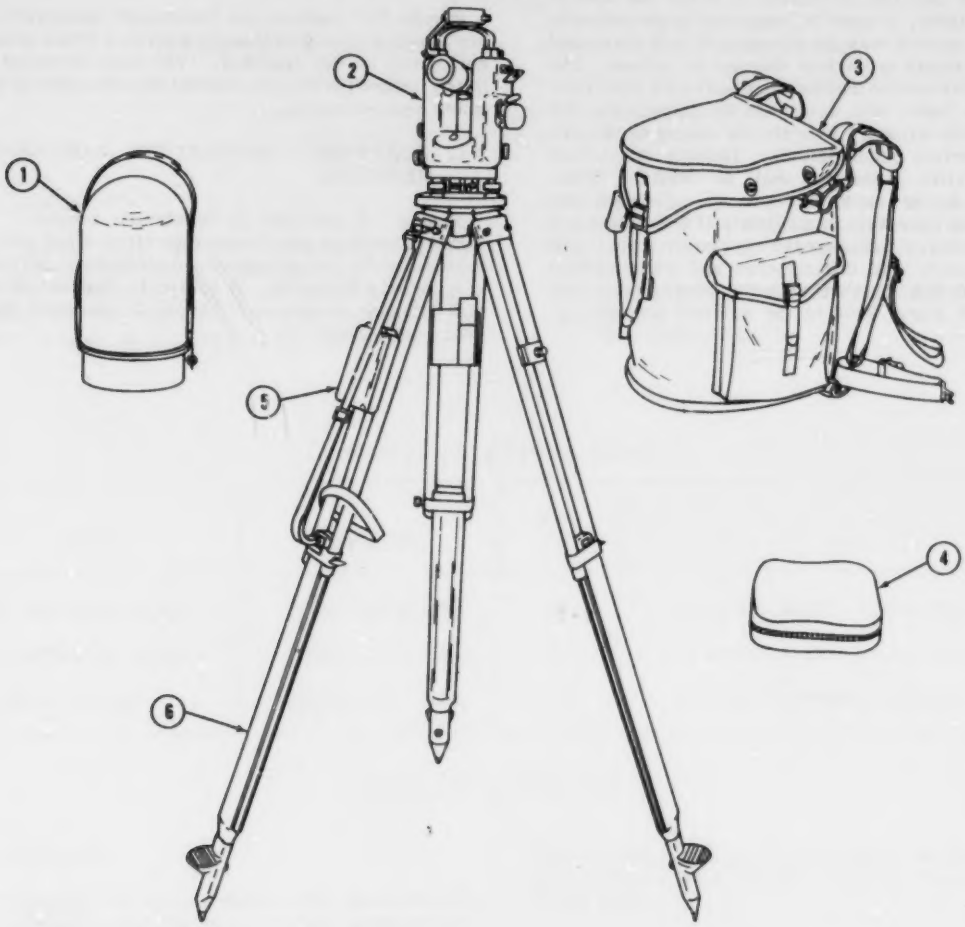
Figure 3-1 contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements.

3-6. QUARTERLY PREVENTIVE MAINTENANCE SERVICES.

Figure 3-2 contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months or 250 hours of operation whichever comes first.

PREVENTIVE MAINTENANCE SERVICES
DAILY

KEUFFEL & ESSER MODEL KE-6 SPECIAL THEODOLITE

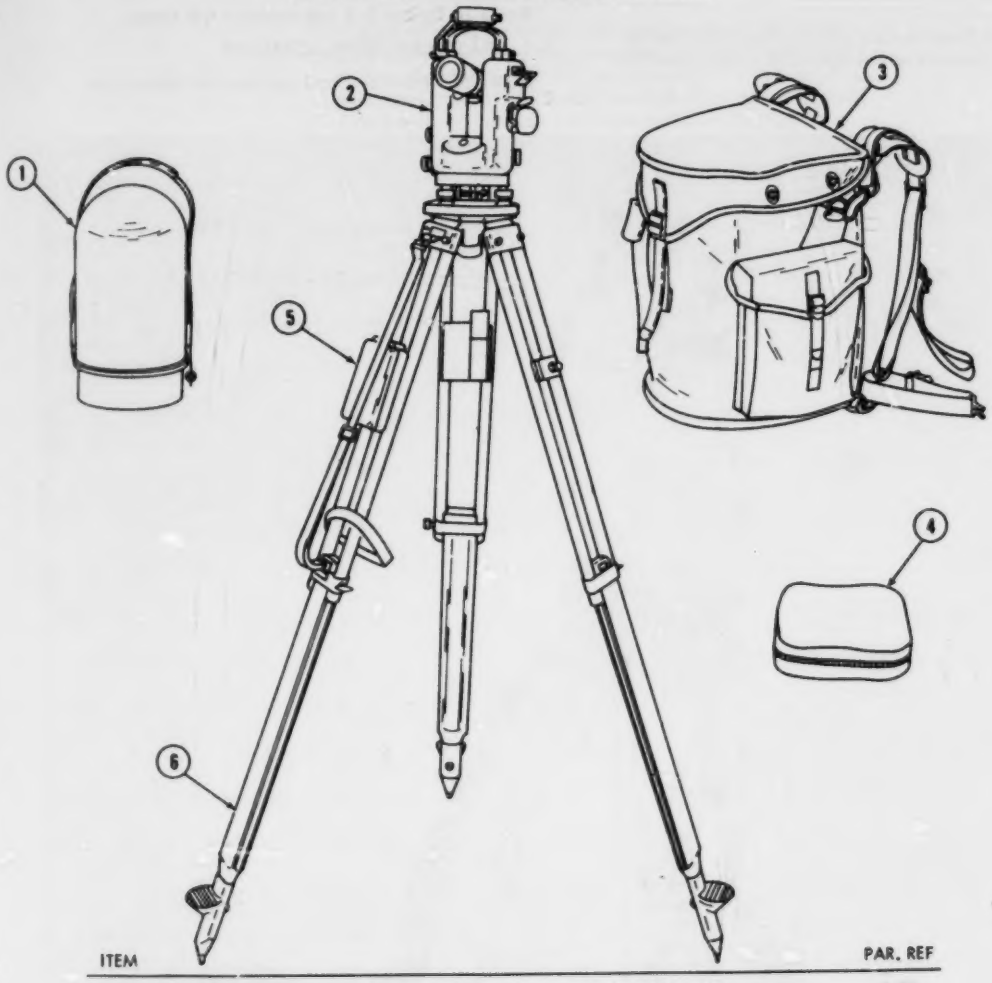


ITEM		PAR. REF
1	CARRYING CASE. Check desiccant for proper color.	
2	THEODOLITE. Clean dirty lenses, mirrors, and windows. Check eyepieces, and all controls for freedom of movement.	
3	KNAPSACK. Clean dirty knapsack.	
4	ACCESSORY CASE. Check for missing components. Clean dirty case.	
5	BATTERY CASE. Check hand lamp for proper operation. Replace defective batteries or lamp. Replace missing spares.	3-8 3-9
6	TRIPOD. Check for missing components. Clean dirty tripod.	

Figure 3-1. Daily preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES
QUARTERLY

KEUFFEL & ESSER MODEL KE-6 SPECIAL THEODOLITE



ITEM		PAR. REF
1	CARRYING CASE. Replace discolored desiccant. Replace defective case.	3-20
2	THEODOLITE. Clean dirty lenses, mirrors, and windows. Check eyepieces and all controls for freedom of movement. Replace defective theodolite.	
3	KNAPSACK. Replace defective knapsack.	3-21
4	ACCESSORY CASE. Replace missing or defective components.	2-3, e
5	BATTERY CASE. Replace defective batteries or lamps. Replace missing spare lamps. Replace defective hand lamp.	2-3 f
6	TRIPOD. Repair or replace defective tripod.	3-32

Figure 3-2. Quarterly preventive maintenance services.

Section IV. OPERATOR'S MAINTENANCE

3-7. GENERAL.

Instructions in this section are published for the information and guidance of the operator to maintain the theodolite.

3-8. LAMP REPLACEMENT.

Refer to figure 3-3 and replace the lamp.

3-9. BATTERY REPLACEMENT.

Refer to figure 3-3 and replace the batteries.

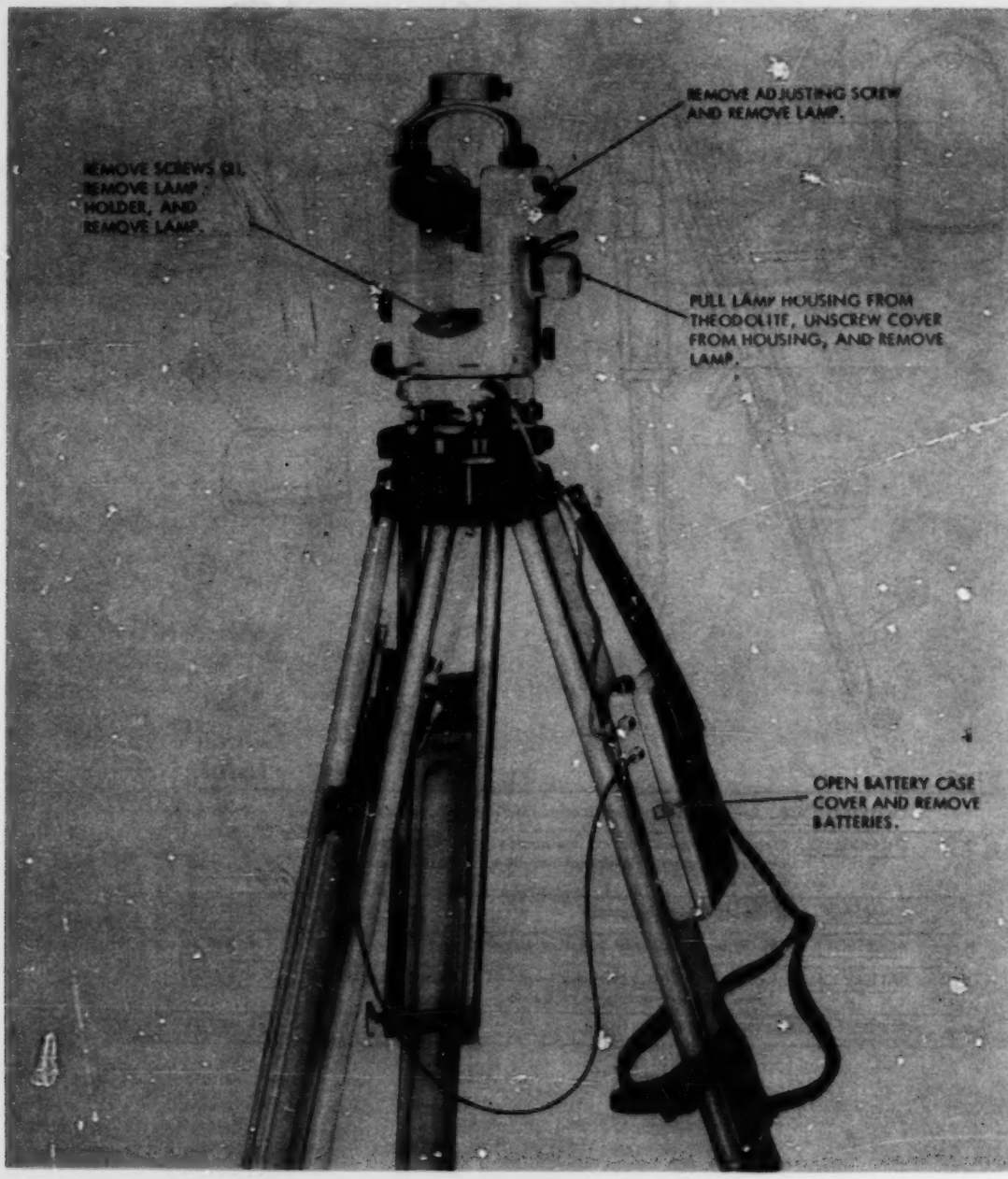

REMOVE ADJUSTING SCREW AND REMOVE LAMP.
REMOVE SCREWS (2), REMOVE LAMP HOLDER, AND REMOVE LAMP.
PULL LAMP HOUSING FROM THEODOLITE, UNSCREW COVER FROM HOUSING, AND REMOVE LAMP.
OPEN BATTERY CASE COVER AND REMOVE BATTERIES.

Figure 3-3. Lamps and batteries, removal and installation.

Section V. TROUBLESHOOTING

3-10. GENERAL.

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the theodolite and its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3-11. THEODOLITE WILL NOT SEAT PROPERLY ON TRIPOD HEAD.

Probable Cause	Possible Remedy
Locking screw improperly started	Restart the locking screw (par. 2-4, b, (2)).
Base plate defective	Replace base plate (par. 3-32).
Tripod head defective	Replace tripod head (par. 3-32).

3-12. THEODOLITE WILL NOT STAY ON LINE.

Probable Cause	Possible Remedy
Theodolite out of level	Level theodolite (par. 2-12, g).
Plate level out of adjustment	Adjust plate level (par. 2-11, c).

3-13. PLATE LEVEL BUBBLE DOES NOT STAY IN CENTER.

Probable Cause	Possible Remedy
Plate level out of adjustment	Adjust plate level (par. 2-11, c).

3-14. TELESCOPE CROSSLINES WILL NOT FOCUS.

Probable Cause	Possible Remedy
Telescope eyepiece defective	Replace eyepiece (par. 3-25).

3-15. CIRCLE AND MICROMETER IMAGES WILL NOT FOCUS

Probable Cause	Possible Remedy
Microscope eyepiece defective	Replace eyepiece (par. 3-25).

3-16. LIGHT ON CIRCLE SCALES UNEQUAL OR ABSENT

Probable Cause	Possible Remedy
Circle illuminating mirror positioned incorrectly or defective	Reposition or replace mirror as necessary (par. 3-30).
Illumination lamp defective	Replace lamp (par. 3-8).

3-17. ILLUMINATION SYSTEM INOPERATIVE.

Probable Cause	Possible Remedy
Batteries improperly installed	Check battery installation.
Defective batteries	Replace batteries (par. 3-9).
Loose or dirty electrical components	Tighten connections or clean terminals, as necessary.

3-18. TRIPOD LEGS WILL NOT LOCK IN POSITION.

Probable Cause	Possible Remedy
Extension leg wing nuts loose or defective	Tighten or replace wing nuts (par. 3-32), as necessary.

Section VI. CARRYING CASE AND KNAPSACK

3-19. GENERAL.

The carrying case for the theodolite is composed primarily of the metal dome and base. The case provides a convenient means of carrying the theodolite and serves as a protective container when the theodolite is not in use. The knapsack is provided to transport the theodolite and carrying case when it is inconvenient to transport the case by its strap.

3-20. CARRYING CASE.

a. Dome.

(1) Removal. Remove dome (par. 2-2, a, (4)).

(2) Disassembly. Refer to figure 3-4 and disassemble dome.

(3) Cleaning, inspection, and repair.

(a) Clean carrying strap with saddle soap.

(b) Inspect dome for dents, cracks, and holes. Inspect bottom rim for out-of-round.

(c) Replace all defective parts that cannot be repaired.

(4) Reassembly. Refer to figure 3-4 and reassemble dome.

(5) Installation. Refer to figure 2-3 and install dome.

b. Base.

(1) Removal. Remove base (par. 2-2, a, (5)

(2) Disassembly. Refer to figure 3-5 and disassemble base.

(3) Cleaning, inspection, and repair.

(a) Inspect rubber beading for damage or hardening.

(b) Remove all burrs from base locking bars, pins, washers, and clamp screws. Replace all defective parts.

(4) Reassembly. Refer to figure 3-5 and reassemble base.

(5) Installation. Refer to figure 2-4 and install base.

3-21. KNAPSACK.

a. Cleaning. Remove dust and dirt from the knapsack with a brush. If necessary, the knapsack can be cleaned with a mild detergent and luke warm water.

b. Inspection and repair. Inspect the knapsack for tears and deterioration. Minor rips may be repaired by sewing. If damage or deterioration is excessive, replace the knapsack.

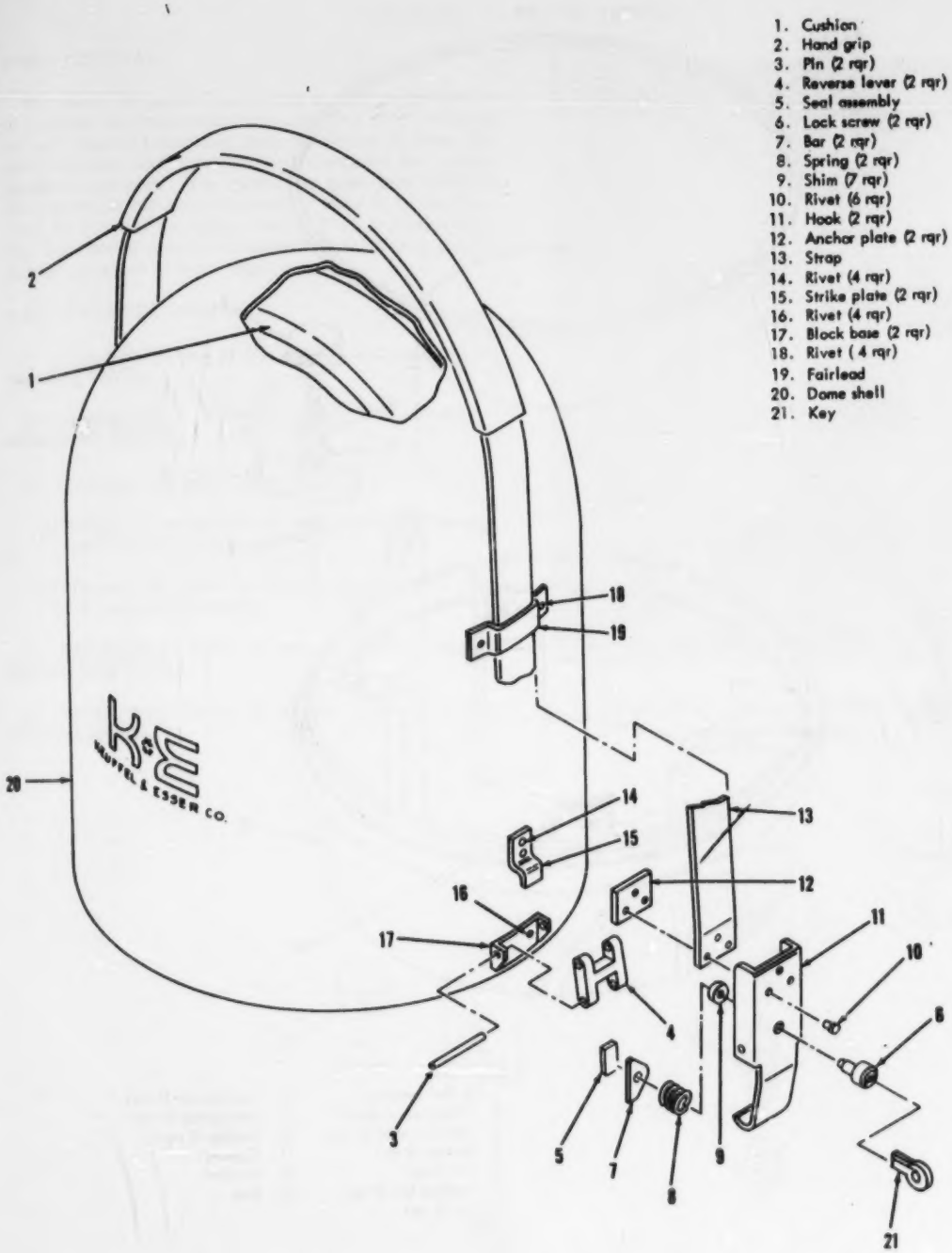
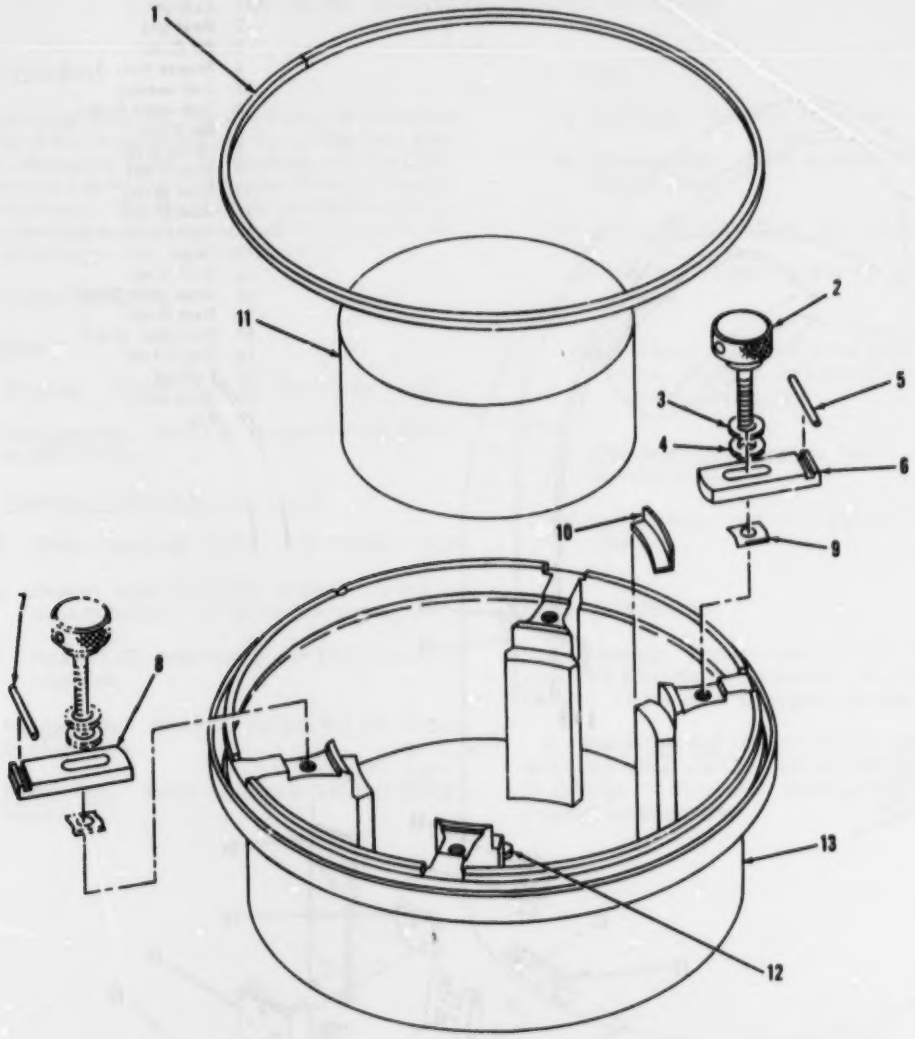


Figure 3-4. Carrying case dome, exploded view.



1. Rubber beading
2. Clamp screw (4rqr)
3. Spring washer (4 rqr)
4. Washer (4 rqr)
5. Pin (2 rqr)
6. Locking bar (2 rqr)
7. Pin (2 rqr)
8. Locking bar (2 rqr)
9. Leaf spring (4 rqr)
10. Bracket (4 rqr)
11. Cushion
12. Setscrew
13. Base

Figure 3-5. Carrying case base, exploded view.

Section VII. CARRYING HANDLE

3-22. GENERAL.

The carrying handle serves as a convenient means of handling the instrument for mounting and removing on the tripod, installing and removing it from the carrying case and also during adjustment and maintenance functions. The handle is also used to carry the theodolite for short distances when it is impractical to use the carrying case. It is recommended that the handle remain installed at all times except during complete disassembly.

3-23. CARRYING HANDLE.

a. Removal. Refer to figure 3-6 and remove the carrying handle.

b. Disassembly. Refer to figure 3-7 and disassemble the carrying handle.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for bends, breaks, and worn or damaged threads.

d. Reassembly. Refer to figure 3-7 and reassemble carrying handle.

e. Installation. Refer to figure 3-6 and install carrying handle.

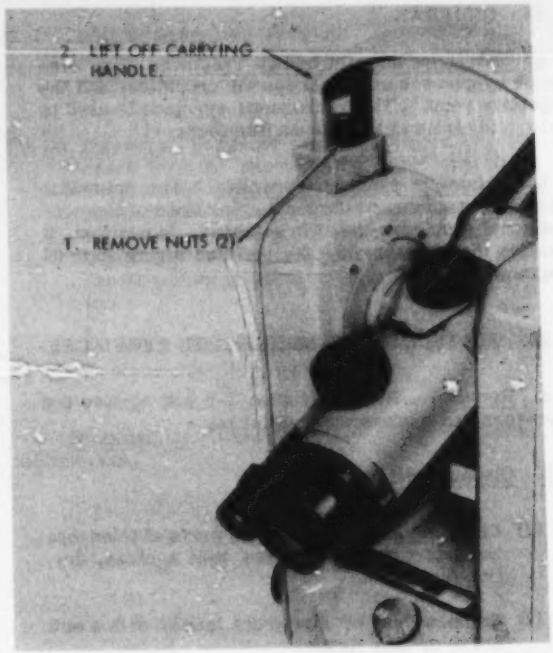


Figure 3-6. Carrying handle, removal and installation.

1. Pin (2 rqr)
2. Nut (2 rqr)
3. Shim (2 rqr)
4. Bolt (2 rqr)
5. Handle
6. Bushing
7. Bushing

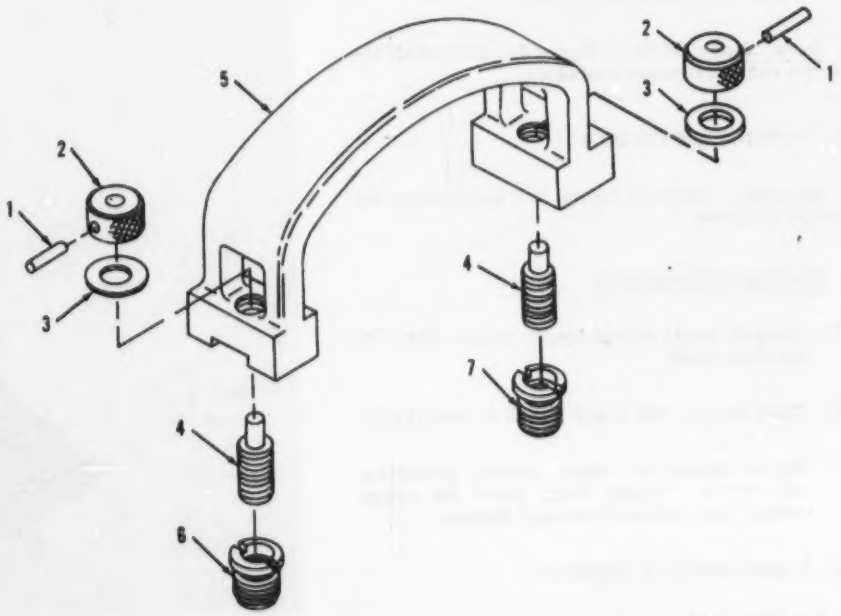


Figure 3-7. Carrying handle, exploded view.

3-24. GENERAL.

a. Telescope and microscope eyepieces. The telescope eyepiece is used to focus the crosslines and the objective point. The microscope eyepiece is used to bring the circle scale images into focus.

b. Prismatic eyepiece assembly. The prismatic eyepiece assembly performs the functions of the conventional eyepieces listed in a. above. In addition, it enables the operator to take inclined sights up to 64 degrees.

3-25. TELESCOPE AND MICROSCOPE EYEPIECES.

a. Removal. Refer to figure 3-8 and remove the telescope and microscope eyepieces.

b. Cleaning and inspection.

(1) Carefully clean non-optical parts of telescope and microscope eyepieces with a clean, dry, lint-free cloth.

(2) Remove dust or dirt from lenses with a soft brush or lens tissue.

(3) Inspect eyepieces for worn or damaged threads, bent or broken metal parts, and chipped, cracked, or etched lenses.

(4) Replace defective eyepieces.

c. Installation. Refer to figure 3-8 and install the telescope and microscope eyepieces.

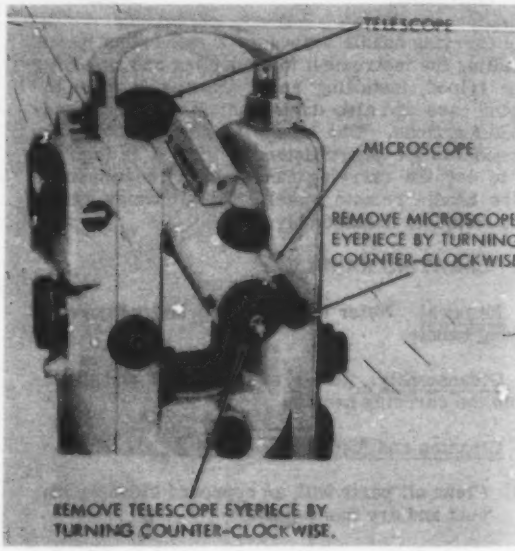


Figure 3-8. Telescope and microscope eyepieces, removal and installation.

3-26. PRISMATIC EYEPIECE.

a. Removal. Refer to figure 3-9 and remove the prismatic eyepiece.

b. Cleaning and inspection.

(1) Clean all parts except lenses with a clean dry lint-free cloth.

(2) Clean lenses with a soft brush or lens tissue.

(3) Inspect lenses for chips, cracks, scratches, and etching. Check metal parts for bends, breaks, and worn or damaged threads.

(4) Replace defective eyepieces.

c. Installation. Refer to figure 2-11 and install the prismatic eyepiece.

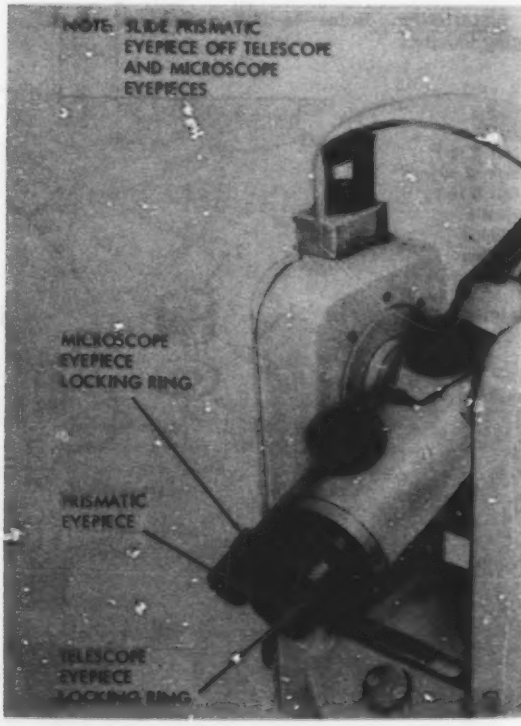

NOTE: SLIDE PRISMATIC EYEPIECE OFF TELESCOPE AND MICROSCOPE EYEPIECES
MICROSCOPE EYEPIECE LOCKING RING
PRISMATIC EYEPIECE
TELESCOPE EYEPIECE LOCKING RING

Figure 3-9. Prismatic eyepiece, removal.

Section IX. TRIBRACH

3-27. GENERAL.

The tribrach consists primarily of the base and upper plates, leveling screws, pressure springs, tilting levers, and center stud clamp. The tribrach serves to quickly and accurately secure the theodolite to the tripod and provides an adjustable base for accurate leveling. The tribrach enables the operator to turn the theodolite in azimuth without the necessity of releveling each time it is moved.

3-28. TRIBRACH.

a. Removal. Refer to figure 3-10 and remove the tribrach.

b. Cleaning and inspection.

(1) Brush all dirt, dust, and foreign matter from tribrach components. Wipe all surfaces clean with a clean, lint-free cloth. Thoroughly clean all bearing surfaces on which the locking levers ride.

(2) Inspect all parts for cracks, and breaks. Inspect leveling screws for proper operation. They should turn smoothly and evenly, yet require a moderate amount of force exerted by thumb and forefinger to turn without backlash. Lubricate bearing surfaces sparingly before reassembling tribrach assembly to the theodolite.

(3) Replace defective tribrach.

c. Installation. Refer to figure 3-10 and install the tribrach.

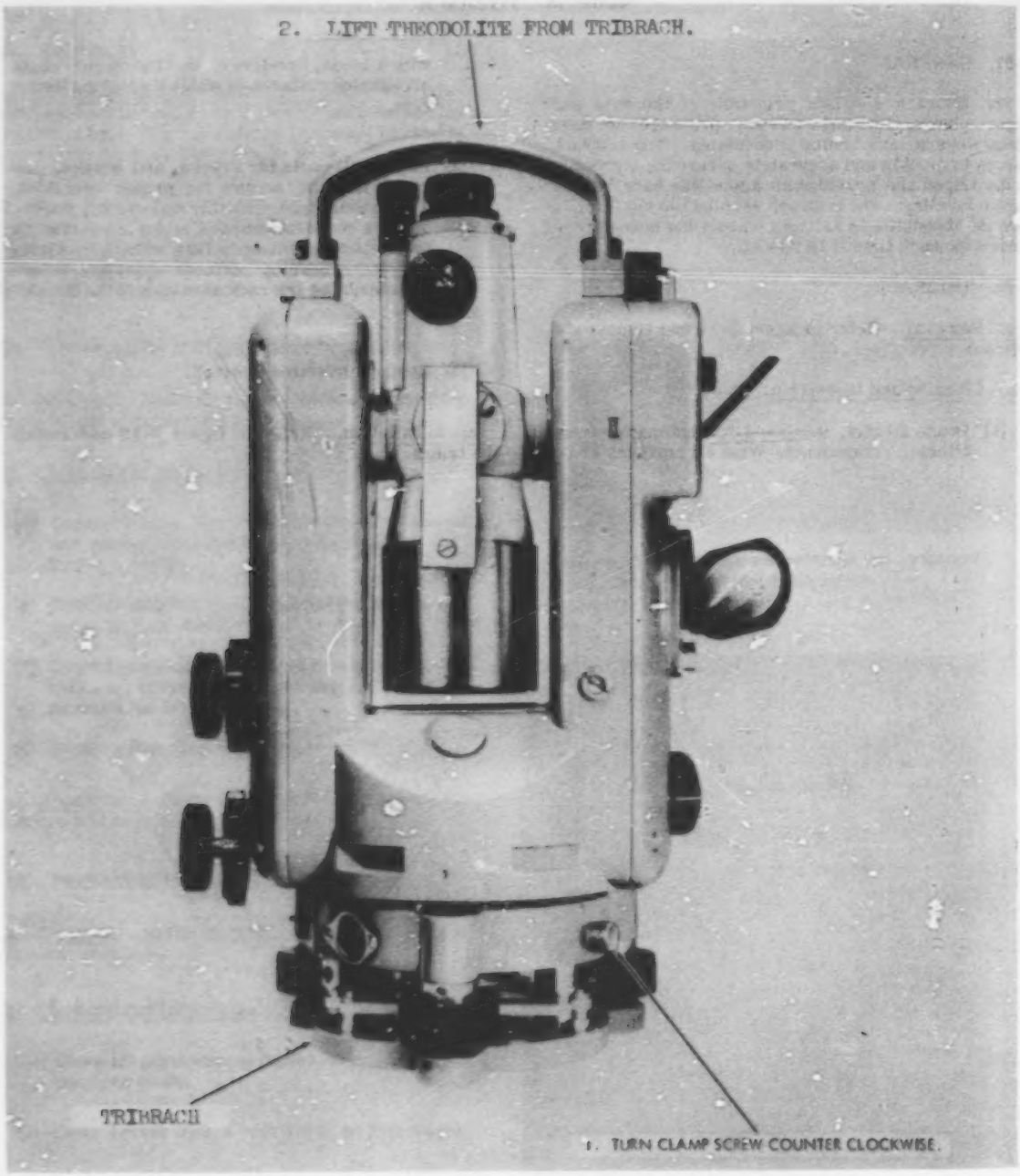


Figure 3-10. Tribrach, removal and installation.

Section X. ILLUMINATION MIRRORS

3-29. GENERAL.

The illumination mirrors are used to reflect available natural light. The circle illumination mirror brightens the circle and microscope scales. The altitude level illumination mirror brightens the altitude level bubble image. At night and on dark days the mirrors are replaced by the illumination lamps.

3-30. ILLUMINATION MIRRORS.

a. Removal. Refer to figure 3-11 and remove the illumination mirrors.

b. Cleaning and inspection.

(1) Clean metal and plastic parts with a clean, lint-free cloth. Clean mirrors with a camel's-hair brush if dusty or lens tissue if foggy.

(2) Inspect hinges action for too-stiff or too-loose movement. Mirrors should remain in position where placed. Check that circle illumination mirror rotates freely. Oil hinges sparingly if needed and wipe off all excess oil. Inspect mirrors for cracks, or breaks.

c. Installation. Refer to figure 3-11 and install the illumination mirrors.

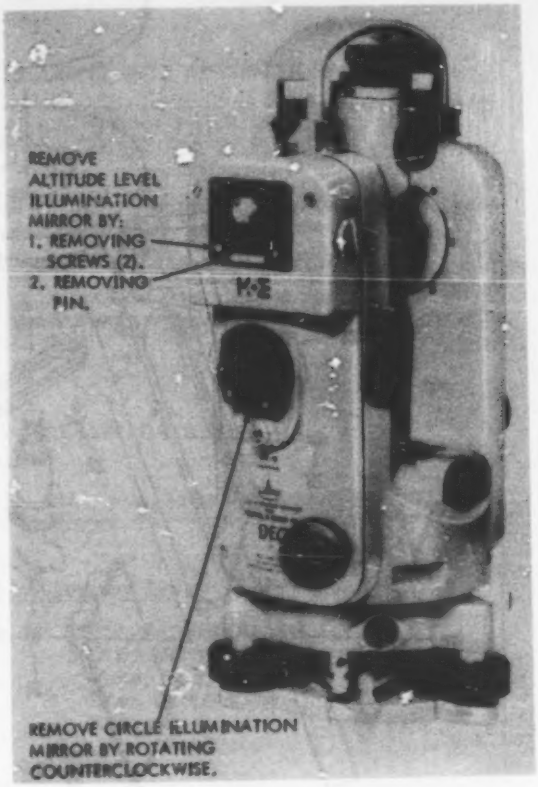

REMOVE ALTITUDE LEVEL ILLUMINATION MIRROR BY:
1. REMOVING SCREWS (2).
2. REMOVING PIN.
REMOVE CIRCLE ILLUMINATION MIRROR BY ROTATING COUNTERCLOCKWISE.

Figure 3-11. Illumination mirrors, removal and installation.

Section XI. TRIPOD, PLUMB BOB, AND TRIPOD WRENCH

3-31. GENERAL.

The tripod is of the extension leg type. When the theodolite is being used for surveying work and other precision measuring, it is mounted on the tripod base plate. The plumb bob and tripod wrench are kept in the leather holder mounted on one of the tripod legs. When installed on the tripod, the plumb bob makes it possible to center the instrument exactly over the station point. The tripod wrench is used to tighten or loosen the clamp bolts under the tripod base plate to hold the tripod legs in position. A clip is mounted on one of the legs to support the battery case. The tripod assembly is provided with straps for lashing the legs together and for hand carrying. When the theodolite is removed from the tripod, the cap should be screwed down over the base plate.

3-32. TRIPOD ASSEMBLY.

a. Disassembly. Refer to figure 3-12 and disassemble the tripod.

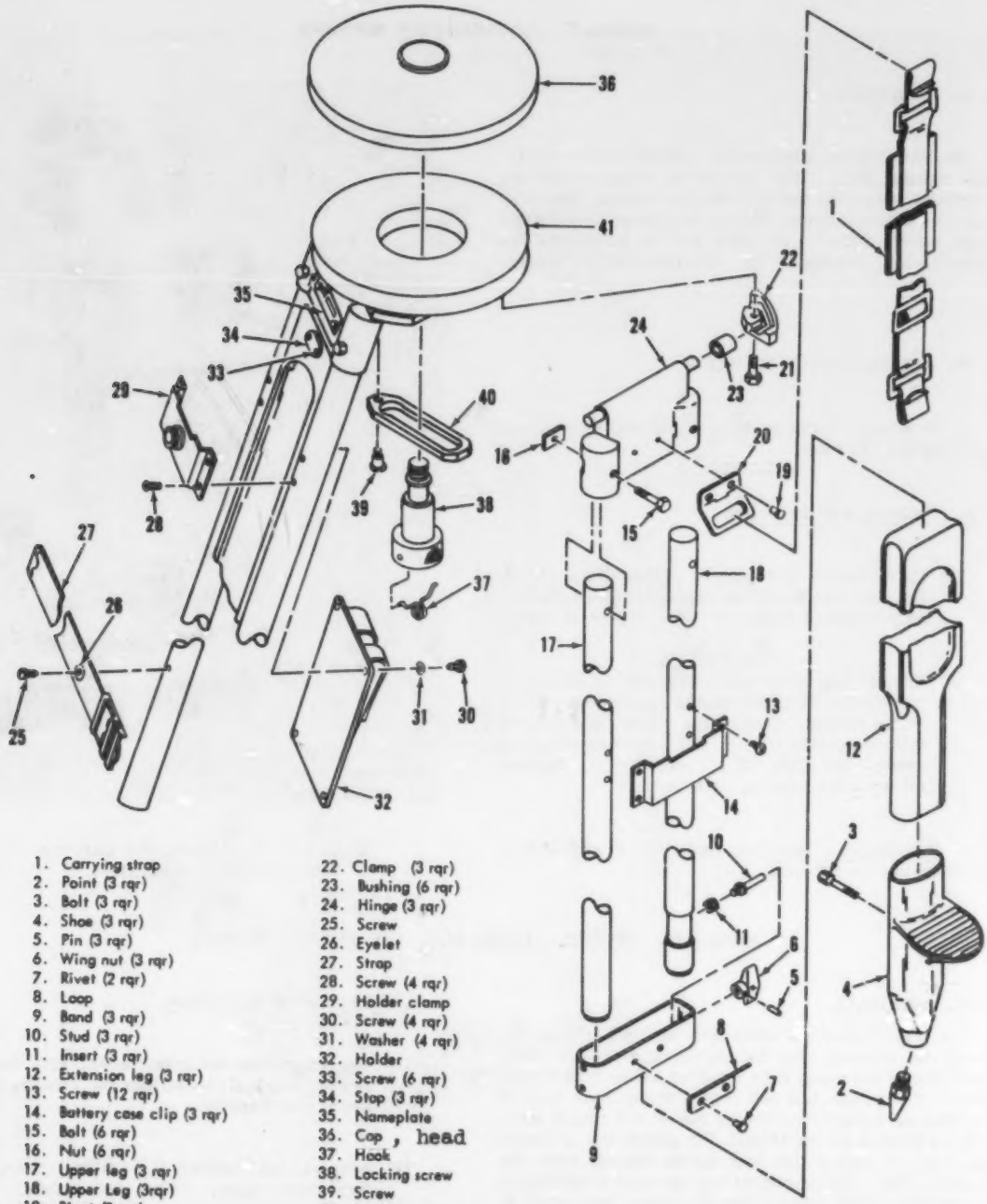
b. Cleaning and inspection.

(1) Inspect straps for cuts, wear, and damaged seams, inspect wooden legs for cracks, splits, wear, and warping.

(2) Remove all burrs and minor scratches. Straighten minor dents and bends. Paint wooden legs if protective coating is worn or damaged. Paint any surface that shows bare metal.

(3) Replace all defective parts that cannot be repaired.

c. Reassembly. Refer to figure 3-12 and reassemble tripod.



1. Carrying strap
2. Point (3 rqr)
3. Bolt (3 rqr)
4. Shoe (3 rqr)
5. Pin (3 rqr)
6. Wing nut (3 rqr)
7. Rivet (2 rqr)
8. Loop
9. Band (3 rqr)
10. Stud (3 rqr)
11. Insert (3 rqr)
12. Extension leg (3 rqr)
13. Screw (12 rqr)
14. Battery case clip (3 rqr)
15. Bolt (6 rqr)
16. Nut (6 rqr)
17. Upper leg (3 rqr)
18. Upper Leg (3rqr)
19. Rivet (2 rqr)
20. Loop
21. Bolt (3 rqr)
22. Clamp (3 rqr)
23. Bushing (6 rqr)
24. Hinge (3 rqr)
25. Screw
26. Eyelet
27. Strap
28. Screw (4 rqr)
29. Holder clamp
30. Screw (4 rqr)
31. Washer (4 rqr)
32. Holder
33. Screw (6 rqr)
34. Stop (3 rqr)
35. Nameplate
36. Cap , head
37. Hook
38. Locking screw
39. Screw
40. Locking strip
41. Base plate

Figure 3-12. Tripod, exploded view.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. SCOPE.

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Keuffel & Esser 73 0041 Special Theodolite. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

4-2. RECORD AND REPORT FORMS.

For record and report forms applicable to direct and general support and depot maintenance, refer to TM38-750.

Section II. DESCRIPTION AND TABULATED DATA

4-3. DESCRIPTION.

For a complete description of the theodolite see paragraph 1-3.

4-4. TABULATED DATA.

a. General. Tabulated data are listed in paragraph 1-4. Engineering data such as tolerances, wear limits, and the like are not available, as the parts of the theodolite are hand-fitted to each other.

b. Time Standards. Table 4-1 lists the number of man hours required under normal conditions to perform the indicated maintenance and repair for the theodolite. Components are listed under the appropriate functional index. The times listed are not intended to be rigid standards. Under adverse conditions, the operations will take longer; but under ideal conditions with higher skilled mechanics, most of the operations can be accomplished in considerably less time.

Table 4-1. Time Standards

	Hours
(1) Lubrication and Service	
67 PRECISION INSTRUMENT	
6700 THEODOLITE.	
Theodolite:	
Clean (general) . . . . . (Use soft cloth, free from dirt and oil, only on exterior parts, not to include lenses and mirrors. Do not use water oil or liquids when cleaning.)	0.3
Clean (special). . . . . (Use lens tissue to clean mirrors and lenses.)	0.4

Table 4-1. Time Standards—Continued

	Hours
(2) Remove and Replace	
18 BODY; CAP; HOOD; HULL.	
1808 CARRYING CASES.	
Dome, carrying case	0.1
Base, carrying case	0.1
Knapsack	0.1
Case, transportation	0.1
22 ACCESSORY ITEMS	
2202 ACCESSORIES	
Case, accessory	0.1
Case, plumb bob	0.1
67 PRECISION INSTRUMENT	
6700 THEODOLITE	
Alidade	0.1
Tribrach	0.1
6701 TELESCOPE	
Axle, telescope . . . . . (Includes removal and installation of telescope, mounting brackets, altitude level, elevation circle and optical train, roof prism assembly, elevation drive, and cover plates.)	9.0
6702 OPTICS	
Eyepiece end, telescope	4.0
Reticle, telescope. . . . . (Includes removal and installation of eyepiece.)	2.25
Objective end, telescope	0.5
Mirror assembly, telescope . . . (Includes removal and installation of telescope objective end.)	1.0

Table 4-1. Time Standards—Continued

	Hours
Microscope	1.5
Eyepiece end, microscope	1.0
Optical plummet	1.0
Circle, azimuth (Includes removal of azimuth center and tangent assembly.)	8.0
Circle, elevation (Includes removal and installation of left standard cover plate, altitude level, and elevation circle optical train.)	6.0
Optical train, elevation circle (Includes removal and installation of left standard cover plate, and altitude level.)	5.0
Prisms, altitude level. (Includes removal and installation of left standard cover plate, and altitude level.)	4.5
Optics assembly, azimuth circle (Includes removal of left standard cover plate.)	4.0
Prism, illumination. (Includes removal and installation of left standard cover plate.)	2.0
Prism, rhomboid (Includes removal and installation of left standard cover plate.)	2.0
Prism assembly, roof (Includes removal and installation of right standard cover plate.)	4.0
Mirror, altitude level illumination	0.5
Mirror, circle illumination.	0.5
6703 MECHANICAL STRUCTURAL, AND PRECISION PARTS	
Tribrach	4.0
Azimuth center and tangent assembly	8.0
Left standard cover plate	0.5
Right standard cover plate	0.5
Repetition clamp (Includes removal and installation of left standard cover plate.)	2.0
Elevation drive system (Includes removal and installation of right standard cover plate.)	3.0
Case, battery	0.1

Table 4-1. Time Standards—Continued

	Hours
6704 BATTERIES	
Battery.	0.1
6705 FUSES AND LAMPS	
Lamp, altitude level.	0.1
Lamp, plate level	0.1
Lamp, lamp housing	0.1
Hand lamp (bulb)	0.1
6710 CIRCUIT COMPONENTS	
Variable capacitor.	2.0
6711 CONTROLS, INDICATORS, AND SPECIAL COMPONENTS	
Switch, hand lamp.	2.0
6712 MOUNTED CONNECTING DEVICES	
Clip, battery.	1.0
Connector, tribrach.	0.5
Receptacle, lamp housing.	1.0
6713 MISCELLANEOUS WIRING AND FITNESS	
Cable, battery case	0.1
Lamp housing	0.5
Internal wiring (Includes removal and installation of left standard cover plate.)	8.0
Connector, battery case	1.0
6718 COMPASS AND LEVELS	
Compass.	2.0
Pivot point, compass	1.0
Level system, altitude	4.5
Level, circular	1.0
Level, coincidence	1.0
Level, plate	2.0
6719 TRIPOD	
Tripod	3.0
Base plate	1.0
Shoe	0.5
Loop and band assembly	0.5
Extension leg	0.2
Upper leg	0.5

CHAPTER 5

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5-1. SPECIAL TOOLS AND EQUIPMENT.

No special tools or equipment are required for direct and general support maintenance personnel for performing maintenance on the theodolite.

5-2. SPECIALLY DESIGNED TOOLS AND EQUIPMENT.

No specially designed tools or equipment are required for direct and general support maintenance personnel for performing maintenance on the theodolite.

Section II. TROUBLESHOOTING

5-3. GENERAL.

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the theodolite or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

5-4. THEODOLITE WILL NOT SEAT PROPERLY ON TRIPOD BASE PLATE.

Probable Cause	Possible Remedy
Tribrach defective	Repair or replace tribrach (par. 6-26).

5-5. THEODOLITE WILL NOT STAY ON LINE.

Probable Cause	Possible Remedy
Vertical travel off line	Adjust or replace telescope mounting brackets (par. 6-25).
Tribrach loose or defective	Repair or replace tribrach (par. 6-26).

5-6. TELESCOPE TURNS TOO HARD OR TOO EASILY.

Probable Cause	Possible Remedy
Telescope mounting bracket defective	Replace mounting bracket (par. 6-25).
Telescope body tube defective	Replace body tube (par. 6-25).

5-7. LEVELING SCREWS TOO TIGHT OR TOO LOOSE.

Probable Cause	Possible Remedy
Leveling screws dirty or worn	Clean, repair, or replace leveling screws (par. 6-26).

5-8. ELEVATION CIRCLE HARD TO MOVE.

Probable Cause	Possible Remedy
Elevation drive system defective	Repair drive system (par. 6-16).
Elevation tangent screw defective	Repair or replace tangent screw (par. 6-16).
Elevation clamp defective	Repair or replace clamp (par. 6-16).

5-9. AZIMUTH CIRCLE HARD TO MOVE.

Probable Cause	Possible Remedy
Azimuth tangent assembly defective	Repair or replace tangent assembly (par. 6-21).
Azimuth tangent screw defective	Repair or replace tangent screw (par. 6-16).
Azimuth clamp defective	Repair or replace clamp (par. 6-16).

5-10. PLATE LEVEL VIAL DEFECTIVE.

Probable Cause	Possible Remedy
Bubble defective	Replace vial (par. 6-18).
Level vial broken	Replace vial (par. 6-18).

5-11. PLATE LEVEL BUBBLE DOES NOT STAY IN CENTER.

Probable Cause	Possible Remedy
Leveling screws loose	Repair or replace leveling screws (par. 6-26).
Bubble jumps	Replace vial (par. 6-18).

5-12. ALTITUDE LEVEL BUBBLE DOES NOT STAY IN CENTER.

Probable Cause	Possible Remedy
Altitude level mount defective	Repair or replace altitude level mount (par. 6-10).
Centering knob defective	Repair or replace knob (par. 6-10).
Bubble jumps	Replace vial (par. 6-10).

5-13. ILLUMINATION SYSTEM FAILS TO FUNCTION.

Probable Cause	Possible Remedy
Wiring defective	Repair or replace wiring.
Slip ring dirty or defective	Clean or repair slip ring (par. 6-21).
Connector defective	Replace connector (par. 6-8 or 6-26).
Variable capacitor	Replace variable capacitor (par 6-5).
Battery case defective	Repair or replace case (par. 6-5).

5-14. CIRCLES HAVE NO LIGHT OR UNEQUAL LIGHT.

Probable Cause	Possible Remedy
Illumination system defective	Refer to paragraph 2-5, b.
Defective prisms	Repair or replace prisms (par. 6-14).

CHAPTER 6

REPAIR INSTRUCTIONS

Section I. THEODOLITE ACCESSORIES

6-1. GENERAL. This section contains those items that are considered accessories and consists of the prismatic eyepiece, magnetic compass, lamp housing, battery case, and accessory case.

6-2. PRISMATIC EYEPIECE.

a. General. The prismatic eyepiece is used for making inclined sights at vertical angles up to 64 degrees. It contains two prisms which are assembled as one unit and each prism can be rotated separately. The unit mounts over the end caps of the telescope eyepiece and the micrometer eyepiece. A filter is provided for the telescope prism to permit direct observations of the sun. The eyepiece is stowed in the accessory case.

b. Disassembly. Disassemble the prismatic eyepiece in the numerical sequence given in figure 6-1.

c. Cleaning.

(1) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

(2) Clean prisms with lens tissue or lens cloth.

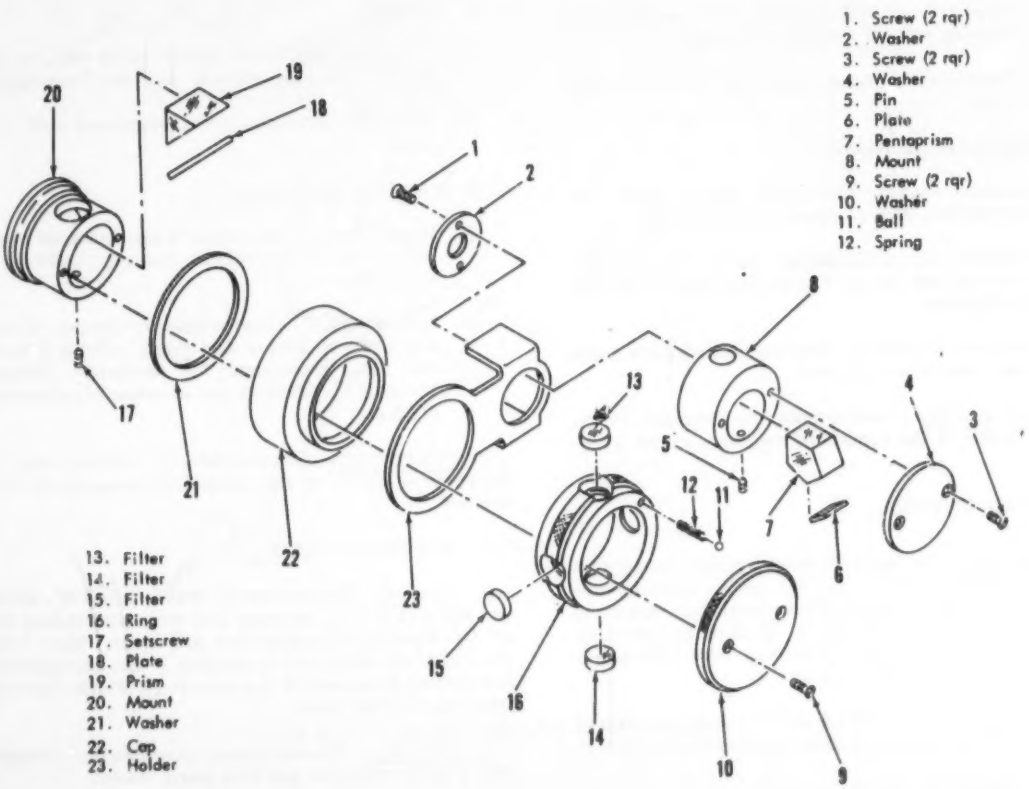


Figure 6-1. Prismatic eyepiece, exploded view.

d. Inspection and Repair.

(1) Inspect prisms for scratches, chips, cracks, and etching.

(2) Inspect all non-optical parts for cracks, breaks, and burrs. Check condition of threads.

(3) Remove all burrs. Replace all defective parts that cannot be repaired.

e. Reassembly. Reassemble the prismatic eyepiece in the reverse order of the numerical sequence given in figure 6-1.

6-3. MAGNETIC COMPASS.

a. General. The magnetic compass mounts on the carrying handle of the theodolite. The compass graduations are observed through an eyepiece at the side of the compass box. The compass is stowed in the accessory case.

b. Disassembly. Disassemble the magnetic compass in the numerical sequence given in figure 6-2.

c. Cleaning.

(1) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

(2) Clean optical parts with lens tissue or lens cloth.

d. Inspection and Repair.

(1) Inspect lenses and other glass parts for scratches, chips, cracks, and etching.

(2) Inspect all non-optical parts for cracks, breaks, and burrs. Check condition of threads and gasket.

(3) Remove all burrs. Replace all defective parts that cannot be repaired.

e. Reassembly. Reassemble the compass in the reverse order of the numerical sequence given in figure 6-2.

6-4. LAMP HOUSING.

a. General. The lamp housing contains a lamp that is used to illuminate the circles during night operations. The housing mounts in the electrical receptacle in the left standard cover plate. Electrical power for the lamp is supplied from the battery case. The housing is stowed in the battery case.

b. Disassembly. Disassemble the lamp housing in the order of the numerical sequence given in figure 6-3.

c. Cleaning.

(1) Clean the parts of the lamps housing with an approved cleaning solvent and dry thoroughly.

(2) Wipe all corrosion from terminals and contacts.

d. Inspection and Repair.

(1) Inspect all parts for distortion, breaks, cracks, and burrs.

(2) Remove any burrs. Replace all defective parts that cannot be repaired.

e. Reassembly. Reassemble the lamp housing in the reverse order of the numerical sequence given in figure 6-3.

6-5. BATTERY CASE.

a. General. The battery case is constructed of plastic and contains six batteries, two dummy batteries, four spare lamps, a hand lamp, a cable, and a lamp housing. A rheostat knob is located at one end and two electrical receptacles (one for the hand lamp and the other for the cable) are located in the front. The case mounts on a clip on one leg of the tripod.

b. Disassembly. Disassemble the battery case in the numerical sequence given in figure 6-4.

c. Cleaning.

(1) Clean all metal and plastic parts with an approved cleaning solvent and dry thoroughly.

(2) Wipe all corrosion from terminals and contacts.

d. Inspection and Repair.

(1) Inspect cables and contacts for damaged insulation and broken wires. Inspect condition of terminals.

(2) Inspect battery case for dents or cracks. Check condition of hinges and latch. Check battery and lamp mountings for security. Inspect rheostat for security and freedom of movement of knob.

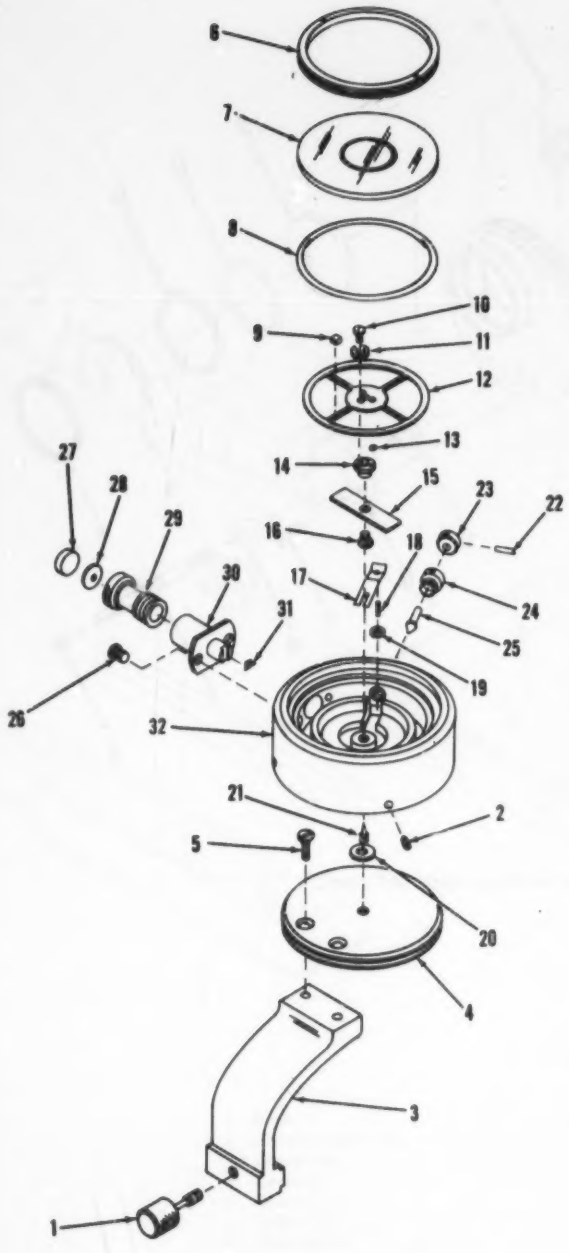
e. Reassembly. Reassemble the battery case in the reverse order of the numerical sequence in figure 6-4.

6-6. ACCESSORY CASE.

a. General. The accessory case is made of canvas and styrofoam as a storage and transport means for all the theodolite accessories and tools, (fig. 2-6). The tools are contained in pouches. The accessories are stowed in cutouts in the styrofoam which fills the lower half of the case.

b. Cleaning. The accessory case can be cleaned with a mild detergent and luke warm water.

c. Inspection and Repair. Inspect case for tears and deterioration. Repair minor rips by sewing. If damage is excessive, replace the case.



1. Screw
2. Setscrew (3 rqr)
3. Holder
4. Washer
5. Screw (2 rqr)
6. Ring
7. Cover glass
8. Gasket
9. Weight (4 rqr)
10. Screw (3 rqr)
11. Washer (3 rqr)
12. Plate
13. Bearing
14. Bushing
15. Magnet
16. Screw
17. Spring
18. Pin
19. Washer
20. Nut
21. Pin
22. Pin
23. Knob
24. Bushing
25. Spindle
26. Screw (2 rqr)
27. Magnifier
28. Diaphragm
29. Mount
30. Bracket
31. Prism
32. Housing

Figure 6-2. Compass, exploded view.

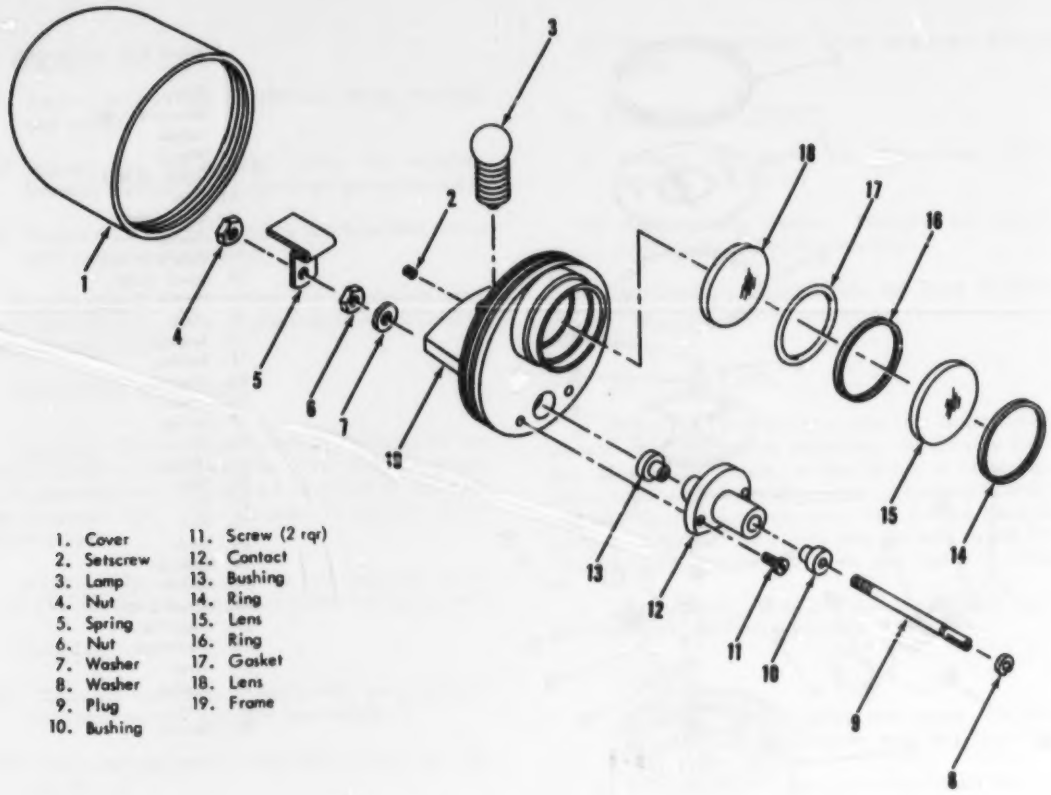
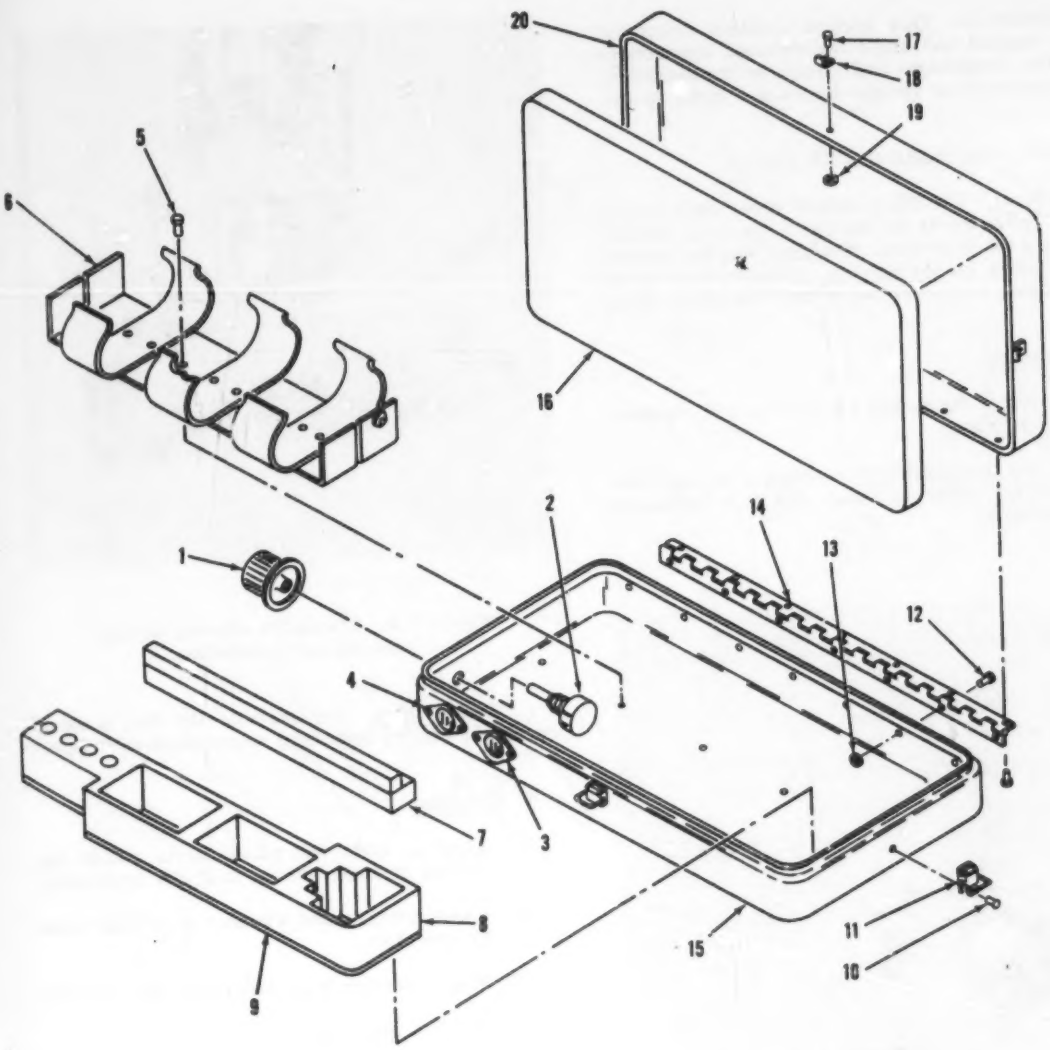


Figure 6-3. Lamp housing, exploded view.



1. Knob
2. Variable capacitor
3. Connector
4. Connector
5. Rivet (4 rqr)
6. Battery clip
7. Polyethylene
8. Polyethylene
9. Polyethylene
10. Rivet (3 rqr)
11. Latch (3 rqr)
12. Rivet (14 rqr)
13. Washer (7 rqr)
14. Hinge
15. Case assembly
16. Polyethylene
17. Rivet (3 rqr)
18. Clip (3 rqr)
19. Washer (3 rqr)
20. Case assembly

Figure 6-4. Battery case, exploded view.

6-7. GENERAL. This section contains direct and general support and depot maintenance instructions for all the components that comprise the theodolite. Repair instructions for the tripod are given in par. 3-31.

6-8. LEFT STANDARD COVER PLATE.

a. General. The left standard cover plate serves as a protective cover for the parts housed in the left standard of the theodolite. The plate also has mounting provisions for the mirrors, altitude level lamp, lamp housing receptacle, and the repetition clamp knob.

b. Removal.

(1) Refer to figure 6-5 and remove left standard cover plate.

(2) If it is necessary to move plate away from theodolite, refer to figure 6-6 and disconnect wiring.

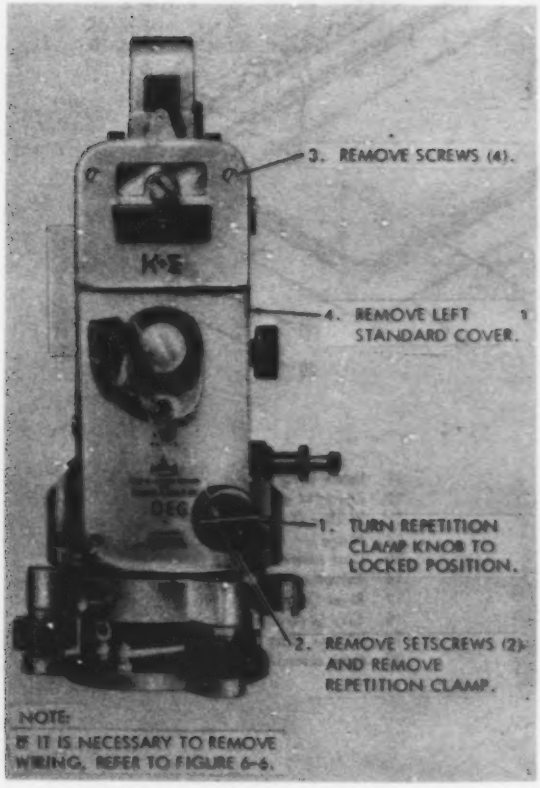

3. REMOVE SCREWS (4).
4. REMOVE LEFT STANDARD COVER.
1. TURN REPETITION CLAMP KNOB TO LOCKED POSITION.
2. REMOVE SETSCREWS (2) AND REMOVE REPETITION CLAMP.
NOTE:
IF IT IS NECESSARY TO REMOVE WIRING, REFER TO FIGURE 6-6.

Figure 6-5. Left standard cover plate, removal and installation.

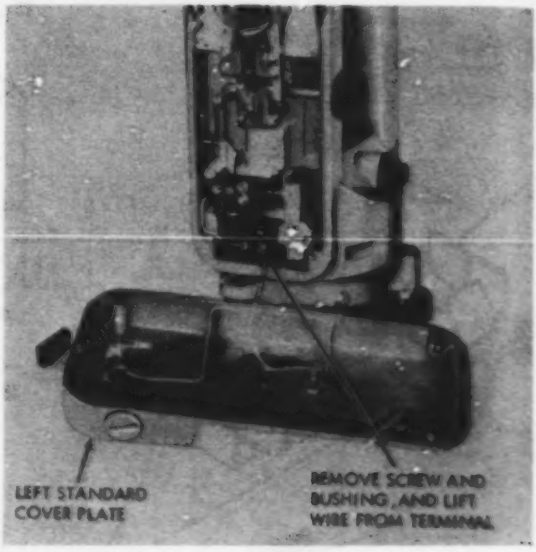


Figure 6-6. Theodolite internal wiring, removal and installation.

c. Disassembly. Disassemble the left standard cover plate in the numerical sequence given in figure 6-7.

d. Cleaning.

(1) Clean all metal and plastic parts with an approved cleaning solvent and dry thoroughly.

(2) Clean mirrors and windows with lens tissue or lens cloth.

(3) Wipe corrosion from terminals and contacts.

e. Inspection and Repair.

(1) Check mirrors and windows for cracks, chips, and scratches.

(2) Check all metal and plastic parts for distortion, cracks, breaks, and burrs.

(3) Check condition of all threads.

(4) Check wiring for frayed or damaged insulation and wire breaks. Check terminals and contacts for condition and corrosion.

(5) Remove all burrs. Replace any part that cannot be repaired.

f. Reassembly. Reassemble the left standard cover plate in the reverse order of the numerical sequence given in figure 6-7.

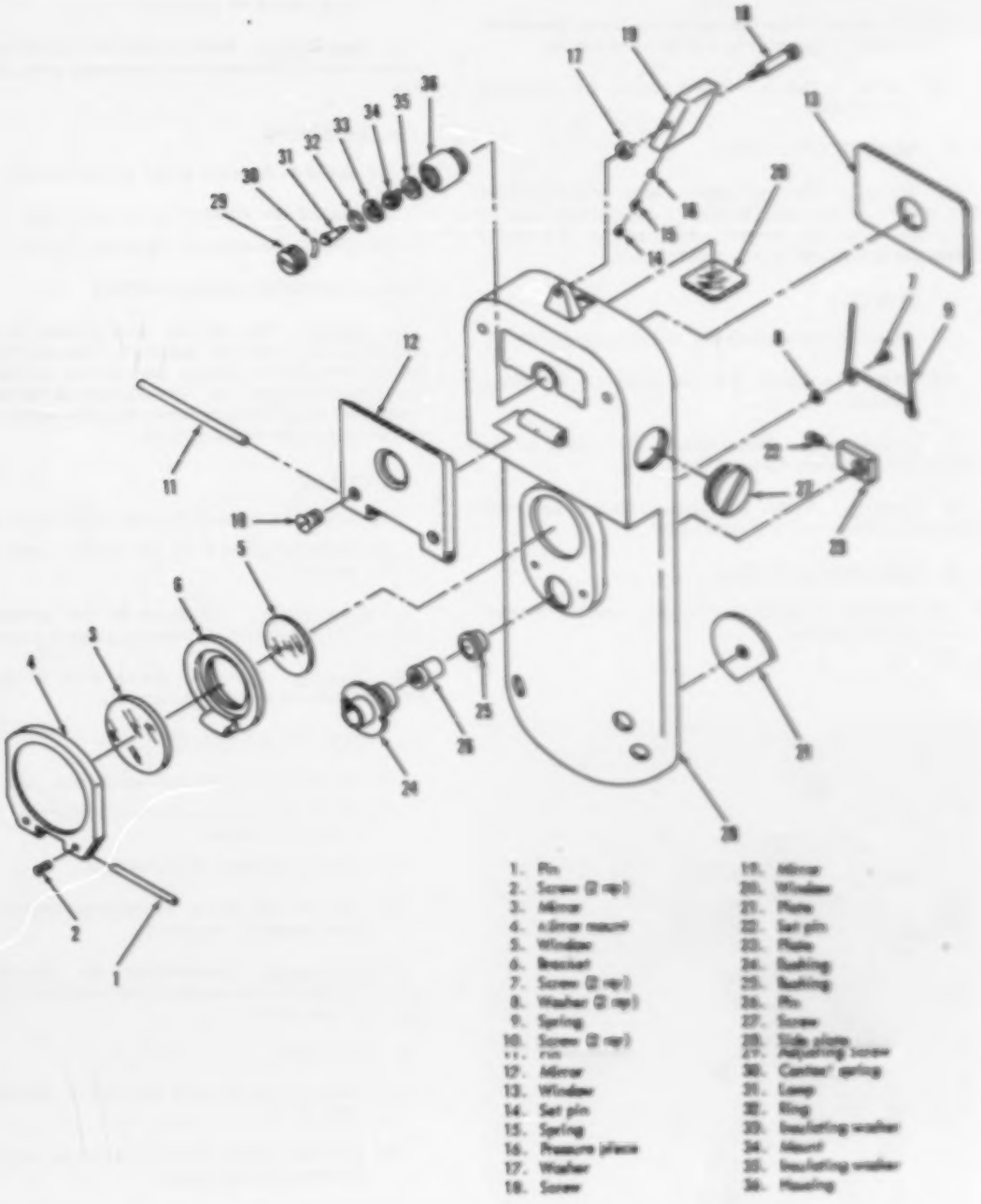


Figure 6-7. Left standard cover plate, exploded view.

g. Installation.

(1) If wiring was disconnected from theodolite refer to figure 6-6, and connect wiring.

(2) Refer to figure 6-5 and install left standard cover plate.

6-9. REPETITION CLAMP.

a. General. The repetition clamp is mounted at the bottom of the left standard. Its control knob is mounted on the left standard cover plate. The clamp locks the theodolite on its vertical axis.

b. Removal.

(1) Remove left standard cover plate (par. 6-8, b).

(2) Refer to figure 6-8 and remove repetition clamp.

c. Disassembly. Disassemble the clamp in the numerical sequence given in figure 6-9.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect all parts for breaks, cracks, distortion or burrs.

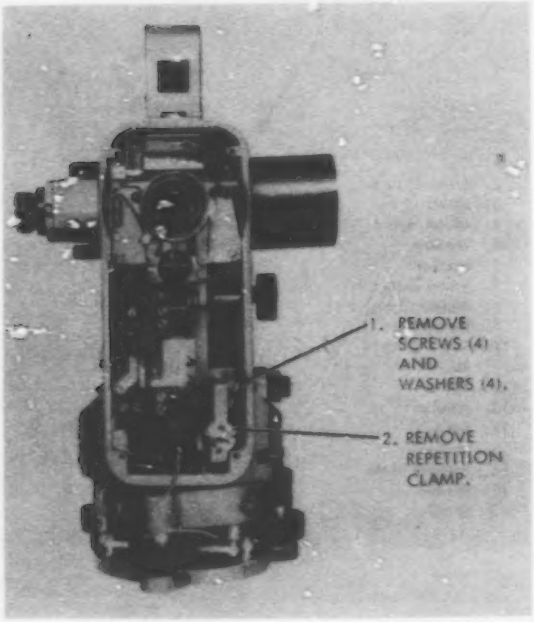


Figure 6-8. Repetition clamp, removal and installation.

(2) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the clamp in the reverse order of the numerical sequence given in figure 6-9.

g. Installation.

(1) Refer to figure 6-8 and install clamp.

(2) Install left standard cover plate (par. 6-8, g).

(3) Check operation of repetition clamp.

6-10. ALTITUDE LEVEL SYSTEM.

a. General. The altitude level system is mounted within the top of the left standard. The position of the bubble is observed through the viewing mirror on the top of the left standard. The position of the bubble is controlled by the altitude level centering screw located at the rear of the left standard.

b. Removal.

(1) Remove left standard cover plate (par. 6-8, b).

(2) Refer to figure 6-10 and remove altitude level system.

c. Disassembly. Disassemble the altitude level system in the numerical sequence given in figure 6-11.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Check level glass for scratches, and cracks.

(2) Check all metal parts for distortion, breaks, cracks, or burrs.

(3) Check condition of all threads.

(4) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the altitude level system in the reverse order of the numerical sequence given in figure 6-11.

g. Installation.

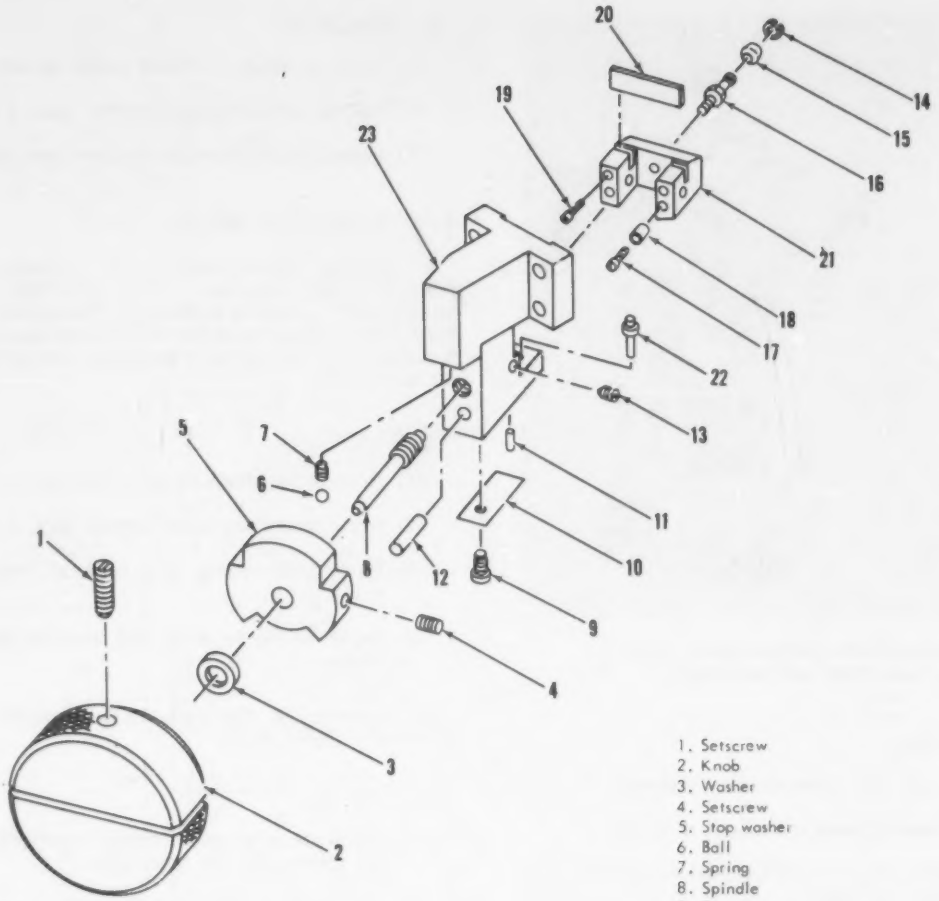
(1) Refer to figure 6-10 and install altitude level system.

(2) Operate altitude level centering screw to check freedom of movement.

(3) Install left standard cover plate (par. 6-8, g).

6-11. ELEVATION CIRCLE OPTICAL TRAIN.

a. General. The elevation circle optical train is mounted within the left standard. The optical train transmits the image of the vertical circle to the microscope field.



1. Setscrew
2. Knob
3. Washer
4. Setscrew
5. Stop washer
6. Ball
7. Spring
8. Spindle
9. Screw
10. Leaf spring
11. Pin
12. Pin
13. Needle screw
14. Lock washer
15. Roller
16. Setscrew pin
17. Setscrew (2 rqr)
18. Spacer (2 rqr)
19. Screw (2 rqr)
20. Leaf spring
21. Forked lever
22. Anvil
23. Mount assembly

Figure 6-9. Repetition clamp, exploded view.

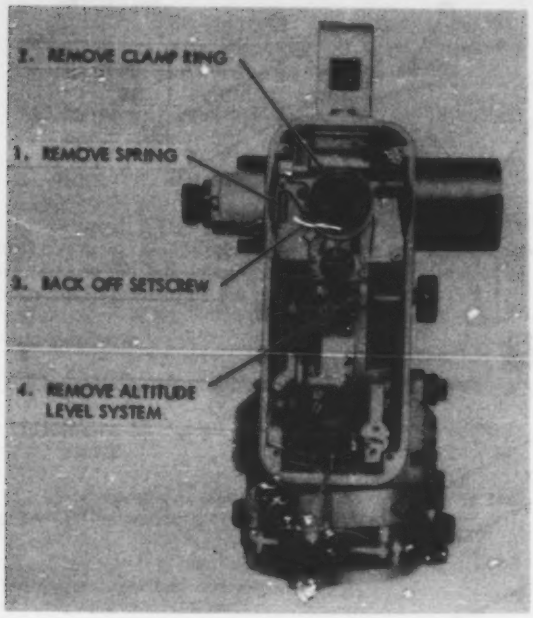


Figure 6-10. Altitude level system, removal and installation.

b. Removal.

(1) Remove left standard cover plate (par. 6-8, b).

(2) Remove altitude level (par. 6-10, b).

(3) Refer to figure 6-12 and remove elevation circle optical train.

c. Disassembly. Disassemble the optical train in the numerical sequence given in figure 6-13.

d. Cleaning.

(1) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

(2) Clean lenses and prisms with lens tissue or lens cloth.

e. Inspection and Repair.

(1) Check lenses and prisms for chips, cracks, scratches, and etching.

(2) Check all metal parts for distortion, cracks, breaks, and burrs.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the optical train in the reverse order of the numerical sequence given in figure 6-13.

g. Installation.

(1) Refer to figure 6-12 and install optical train

(2) Install altitude level system (par. 6-10, g)

(3) Install left standard cover plate (par. 6-8, g)

6-12. ELEVATION CIRCLE.

a. General. The elevation circle is mounted on the left axle of the telescope. The circle has degree graduations around its perimeter. These graduations reflect the vertical position of the telescope and are transmitted by the optical train of the viewing field of the microscope.

b. Removal.

(1) Remove left standard cover plate (par. 6-8 b

(2) Remove altitude level system (par. 6-10, b)

(3) Remove elevation circle optical train (par. 6-11, b).

(4) Refer to figure 6-14 and remove elevation circle.

c. Disassembly. Disassemble the elevation circle as shown in figure 6-15.

d. Cleaning.

(1) Clean all metal parts with an approved cleaning solvent and dry thoroughly.

(2) Clean circle with lens tissue or lens cloth

e. Inspection and Repair.

(1) Check all metal parts for distortion, cracks breaks, and burrs.

(2) Inspect circle for chips, cracks, scratches and etching.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the elevation circle in the reverse order of the numerical sequence given in figure 6-15.

g. Installation.

(1) Refer to figure 6-14 and install circle.

(2) Install elevation circle optical train (par. 6-11, g).

(3) Install altitude level system (par. 6-10, g)

(4) Install left standard cover plate (par. 6-8, g)

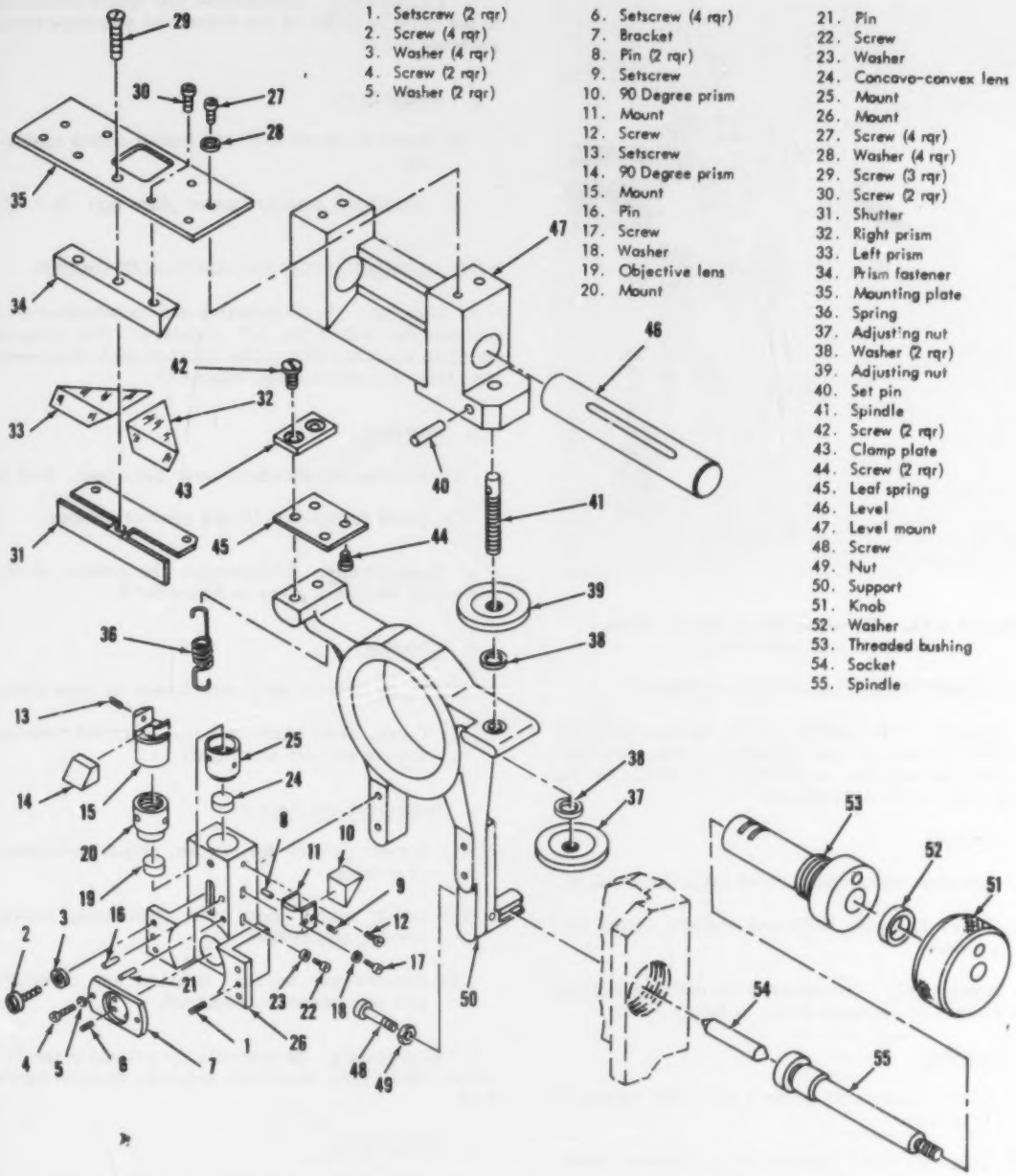


Figure 6-11. Altitude level system, exploded view.

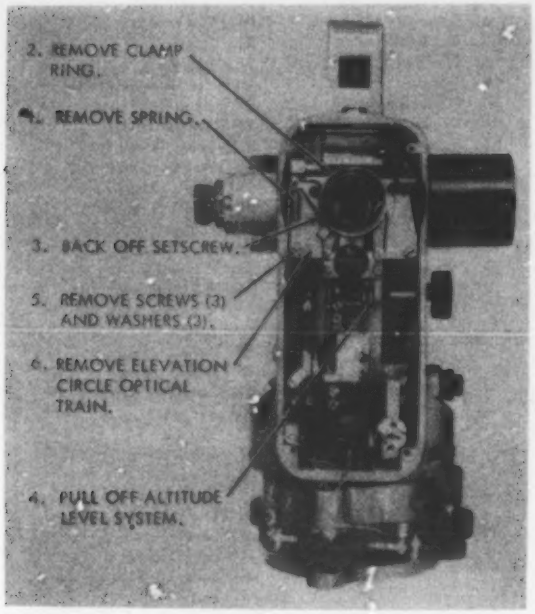

2. REMOVE CLAMP RING.
1. REMOVE SPRING.
3. BACK OFF SETSCREW.
5. REMOVE SCREWS (3) AND WASHERS (3).
6. REMOVE ELEVATION CIRCLE OPTICAL TRAIN.
4. PULL OFF ALTITUDE LEVEL SYSTEM.

Figure 6-12. Elevation circle optical train, removal and installation.

6-13. AZIMUTH CIRCLE OPTICS ASSEMBLY.

a. General. The azimuth circle optics assembly is mounted within the left standard. The assembly transmits the images on the azimuth circle to the viewing field of the microscope.

b. Removal.

(1) Remove left standard cover plate (par. 6-8, b).

(2) Refer to figure 6-16 and remove optics assembly.

c. Disassembly. Disassemble the optics assembly in the numerical sequence given in figure 6-17.

d. Cleaning.

(1) Clean lenses and prisms with lens tissue or lens cloth.

(2) Clean all metal parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect lenses and prisms for scratches, chips, cracks, and etching.

(2) Check metal parts for distortion, cracks, breaks, and burrs.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the optics assembly in the reverse order of the numerical sequence given in figure 6-17.

g. Installation.

(1) Refer to figure 6-16 and install optics assembly.

(2) Install left standard cover plate (par. 6-8, g).

6-14. ILLUMINATION AND RHOMBOID PRISMS.

a. General. The illumination and rhomboid prisms are mounted within the left standard. The prisms serve to transmit light to the microscope to illuminate the circle and microscope images.

b. Removal.

(1) Remove left standard cover plate (par. 6-8 b).

(2) Refer to figure 6-18 and remove prisms.

c. Disassembly. Disassemble the prisms in the numerical sequence given in figure 6-19.

d. Cleaning.

(1) Clean prisms with lens tissue or lens cloth.

(2) Clean metal parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect prisms for cracks, chips, scratches, or etching.

(2) Check metal parts for distortion, burrs, cracks, and breaks.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the prisms in the reverse order of the numerical sequence given in figure 6-19.

g. Installation.

(1) Refer to figure 6-18 and install prisms.

(2) Install left standard cover plate (par. 6-8 g).

6-15. RIGHT STANDARD COVER PLATE.

a. General. The right standard cover plate serves as a protective cover for the parts housed in the right standard of the theodolite. The cover has mounting provisions for the elevation clamp and tangent screw and the azimuth clamp and tangent screw.

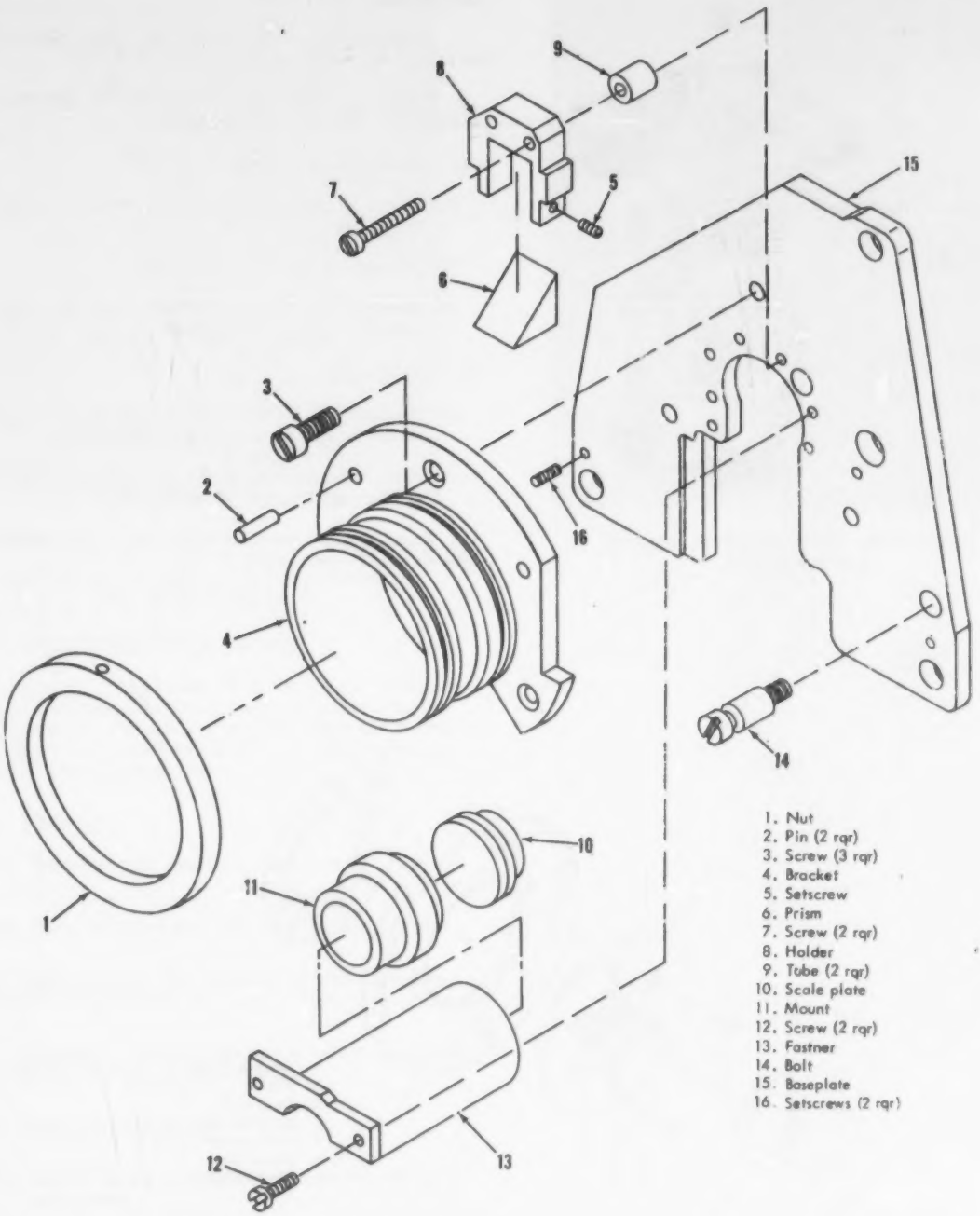


Figure 6-13. Elevation circle optical train, exploded view.

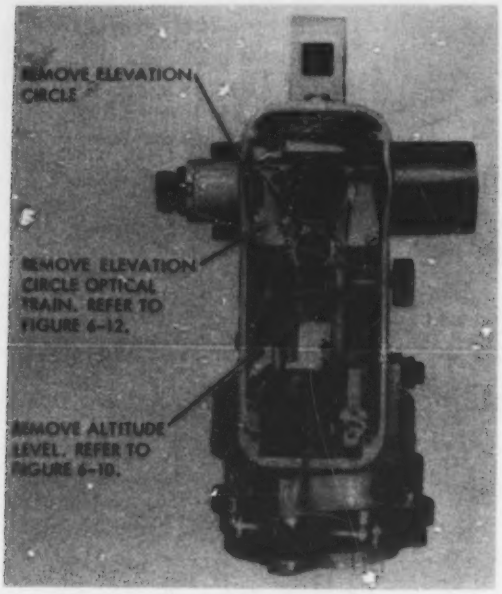

REMOVE ELEVATION CIRCLE
REMOVE ELEVATION CIRCLE OPTICAL TRAIN. REFER TO FIGURE 6-12.
REMOVE ALTITUDE LEVEL. REFER TO FIGURE 6-10.

Figure 6-14. Elevation circle, removal and installation.

b. Removal. Refer to figure 6-20 and remove right standard cover plate.

c. Disassembly. Disassemble the cover plate in the numerical sequence given in figure 6-21.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Check all parts for distortion, cracks, breaks, and burrs.

(2) Inspect condition of all threads.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly.

(1) Reassembly cover plate in reverse order of numerical sequence given in figure 6-21.

(2) After reassembly, check tangent screws and clamps for freedom of movement.

g. Installation. Refer to figure 6-20 and install right standard cover plate.

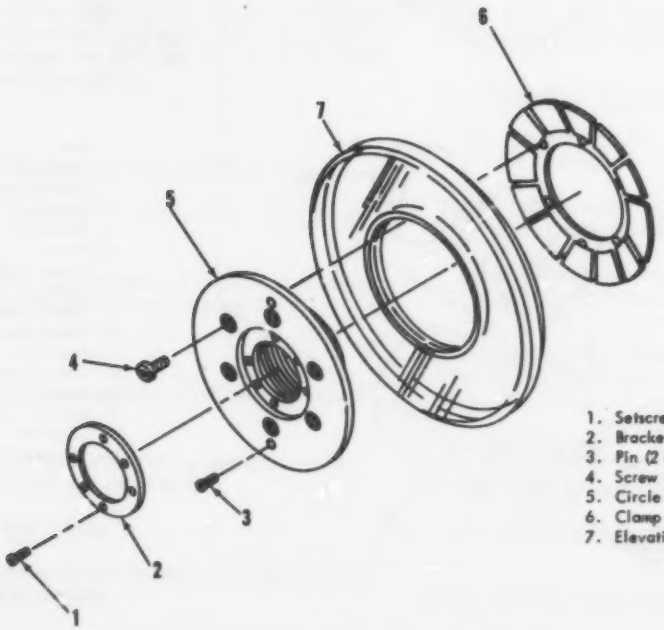


Figure 6-15. Elevation circle, exploded view.

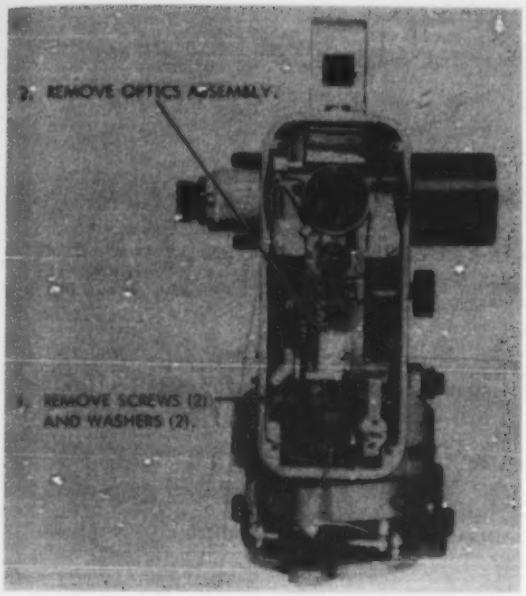


Figure 6-16. Azimuth circle optics assembly, removal and installation.

6-16. ELEVATION DRIVE SYSTEM.

a. General. The elevation drive system is housed in the right standard. The system consists of the elevation tangent, elevation drive, balljoint, and clamp. The system transmits motion of the elevation tangent screw to the telescope axis.

b. Removal.

(1) Remove right standard cover plate (par. 6-15, b).

(2) Refer to figure 6-22 and remove drive system.

c. Disassembly. Disassemble the elevation drive system in the numerical sequence given in figure 6-23.

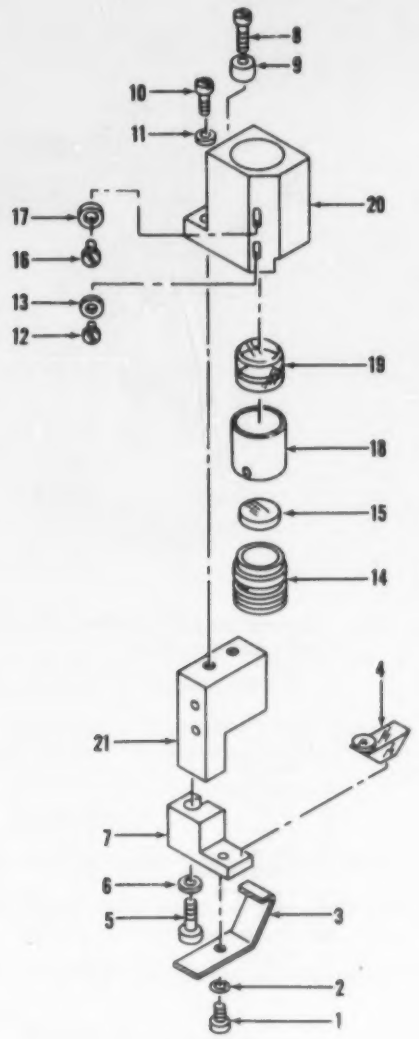
d. Cleaning. Clean all the parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Check parts for distortion, cracks, breaks, and burrs.

(2) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the elevation drive system in the reverse order of the sequence numbers given in figure 6-23.



1. Screw
2. Washer
3. Diaphragm
4. Illumination prism
5. Screw
6. Washer
7. Holder
8. Screw
9. Bushing
10. Screw
11. Washer
12. Screw
13. Washer
14. Mount
15. Lens
16. Screw
17. Washer
18. Mount
19. Rear lens
20. Lens mount
21. Base

Figure 6-17. Azimuth circle optics assembly, exploded view.

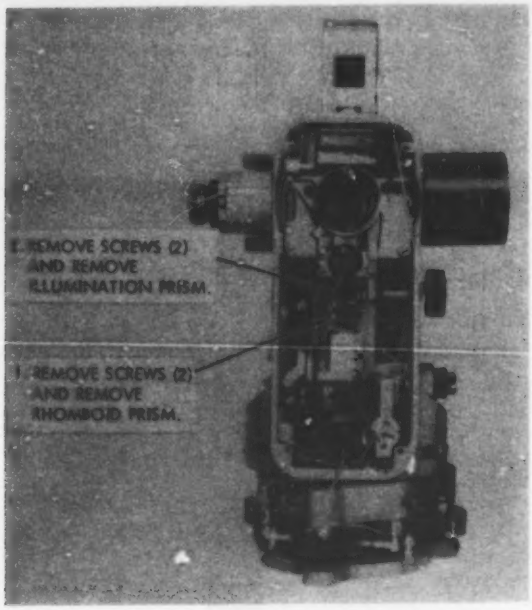


Figure 6-18. Illumination and rhomboid prisms, removal and installation.

g. Installation.

(1) Refer to figure 6-22 and install drive system.

(2) Install right standard cover plate (par. 6-15, g).

6-17. ROOF PRISM ASSEMBLY.

a. General. The roof prism assembly is mounted in the left axle of the telescope. The prism assemble provides erect right reading images to the field of the microscope.

b. Removal.

(1) Remove right standard cover plate (par. 6-15, b).

(2) Refer to figure 6-24 and remove roof prism assembly.

c. Disassembly. Disassemble the roof prism assembly in the numerical sequence given in figure 6-25.

d. Cleaning.

(1) Clean prism with lens tissue or lens cloth.

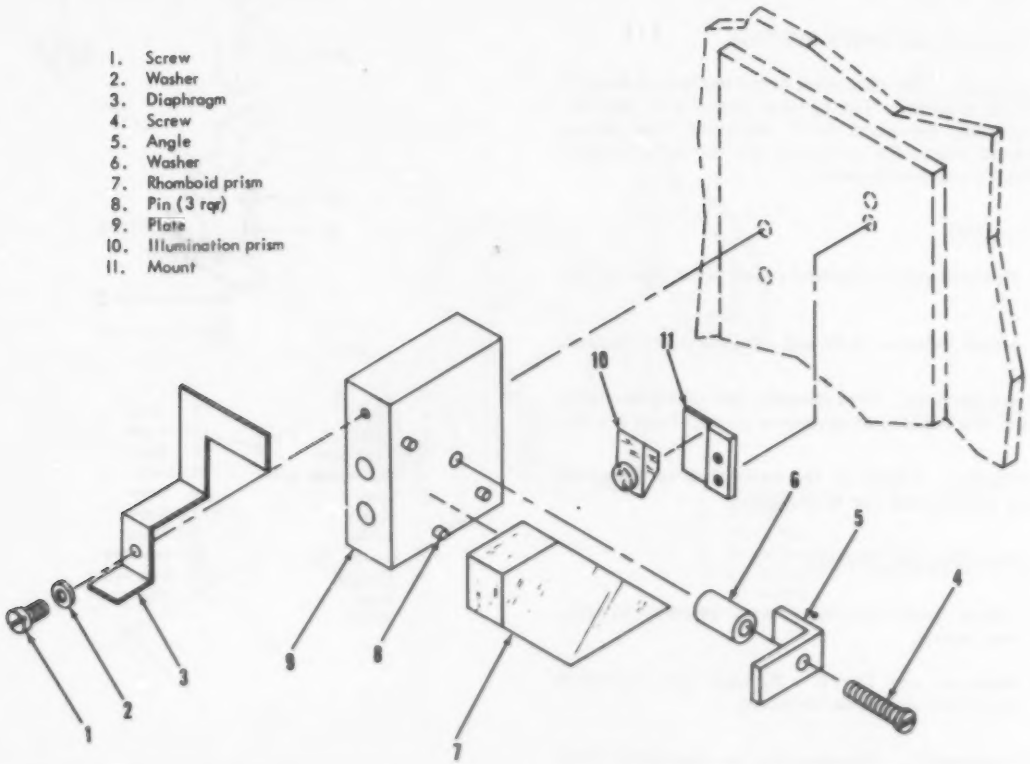


Figure 6-19. Illumination and rhomboid prisms, exploded view.

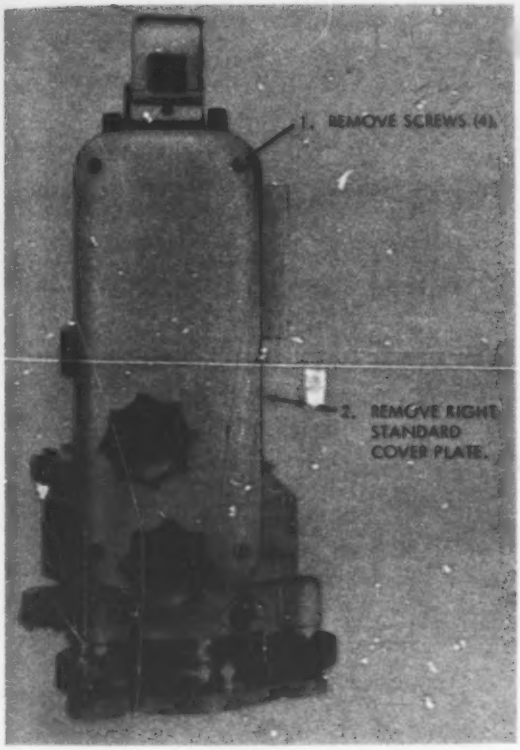


Figure 6-20. Right standard cover plate, removal and installation.

(2) Clean metal parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect prism for chips, cracks, scratches, or etching.

(2) Inspect metal parts for distortion, cracks, breaks, and burrs.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the roof prism assembly in the reverse order of numerical sequence given in figure 6-25.

g. Installation.

(1) Refer to figure 6-24 and install roof prism assembly.

(2) Install right standard cover plate (par. 6-15, g).

6-18. PLATE LEVEL.

a. General. The plate level is mounted in the base of the standard, above the optical plummet eyepiece. The level reflects precise leveling of the theodolite.

b. Removal.

(1) Remove right standard cover plate (par. 6-15, b).

(2) Remove left standard cover plate (par. 6-8, b).

(3) Refer to figure 6-26 and remove plate level.

c. Disassembly. Disassemble the plate level in the numerical sequence given in figure 6-27.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect level vial for cracks, etching, and defective bubble.

(2) Check all metal parts for distortion, cracks, breaks, and burrs.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the plate level in the reverse order of the numerical sequence given in figure 6-27.

g. Installation.

(1) Refer to figure 6-26 and install level.

(2) Install right standard cover plate (par. 6-15, g).

(3) Install left standard cover plate (par. 6-8, g).

6-19. PLATE LEVEL LAMP.

a. General. The plate level lamp is mounted in the front of the standard base. The lamp illuminates the plate level during night time operations. Power for the lamp is supplied from the battery case.

b. Removal. Refer to figure 6-28 and remove the plate level lamp.

c. Disassembly. Disassemble the plate level lamp in the numerical sequence given in figure 6-29.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Check all parts for distortion, cracks, breaks, and burrs.

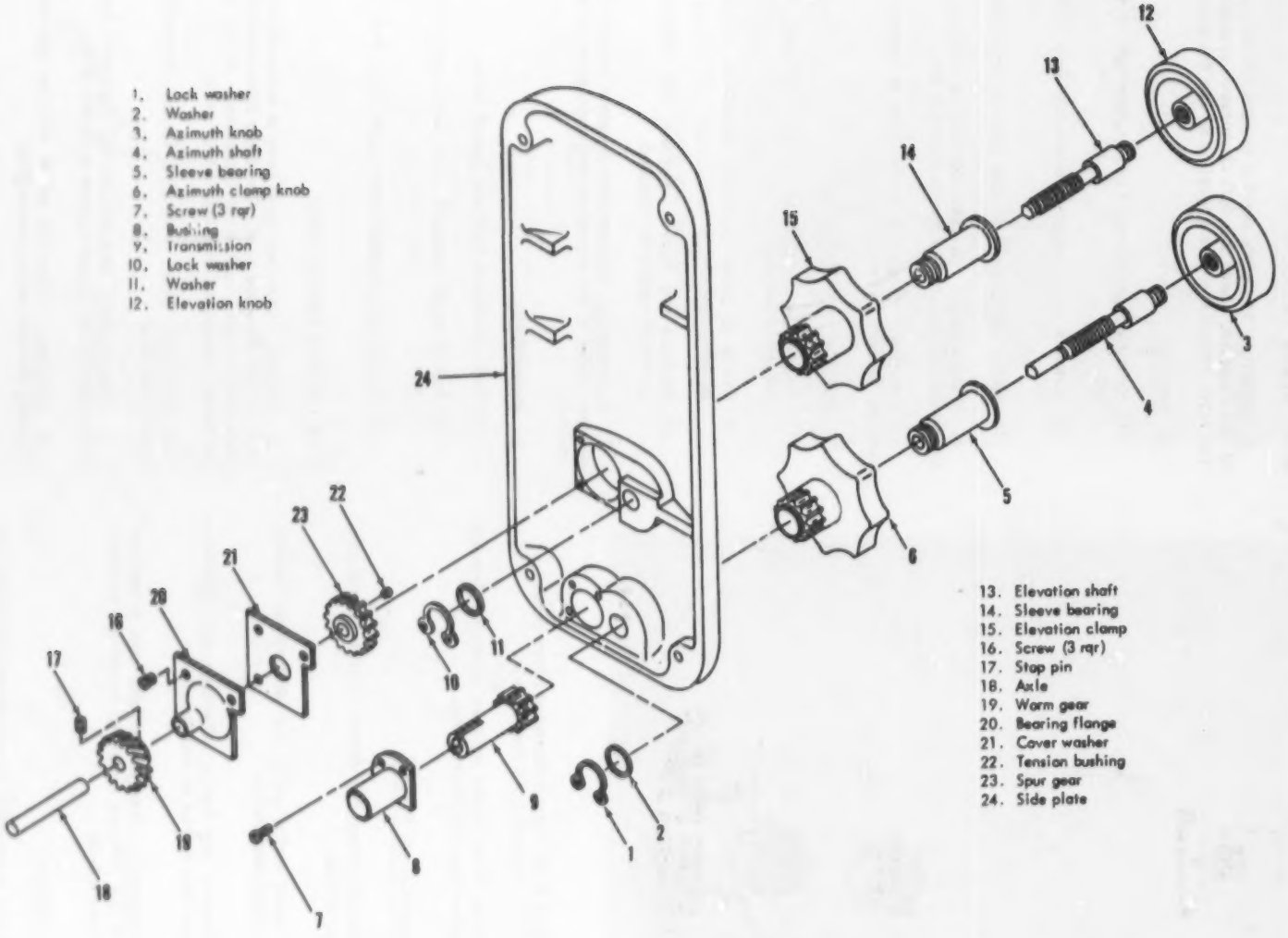


Figure 6-21. Right standard cover plate, exploded view.

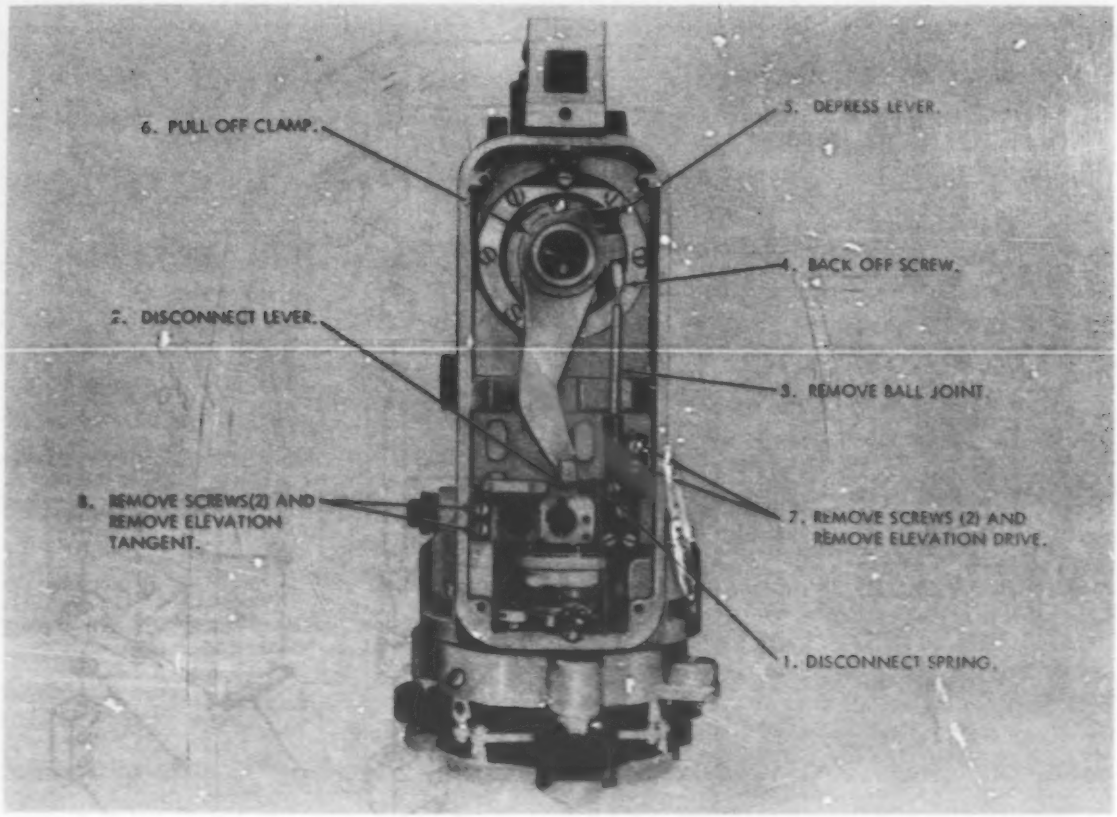

6. PULL OFF CLAMP.
5. DEPRESS LEVER.
4. BACK OFF SCREW.
2. DISCONNECT LEVER.
3. REMOVE BALL JOINT.
8. REMOVE SCREWS(2) AND REMOVE ELEVATION TANGENT.
7. REMOVE SCREWS (2) AND REMOVE ELEVATION DRIVE.
1. DISCONNECT SPRING.

Figure 6-22. Elevation drive system, removal and installation.

(2) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the plate level lamp in the reverse order of the numerical sequence given in figure 6-29.

g. Installation. Refer to figure 6-28 and install plate level lamp.

6-20. OPTICAL PLUMMET.

a. General. The optical plummet is mounted in the base of the standard. The plummet consists of three assemblies; the eyepiece, pentaprism and mount, and objective. The plummet is used to precisely center the azimuth axis of the theodolite over the station point.

b. Removal. Refer to figure 6-30 and remove the optical plummet.

c. Disassembly. Disassemble the plummet in the numerical sequence given in figure 6-31.

d. Cleaning.

(1) Clean lenses and prisms with lens tissue or lens cloth.

(2) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect the lenses and prisms for scratches, cracks, chips, and etching

(2) Check all non-optical parts for distortion, cracks, breaks and burrs.

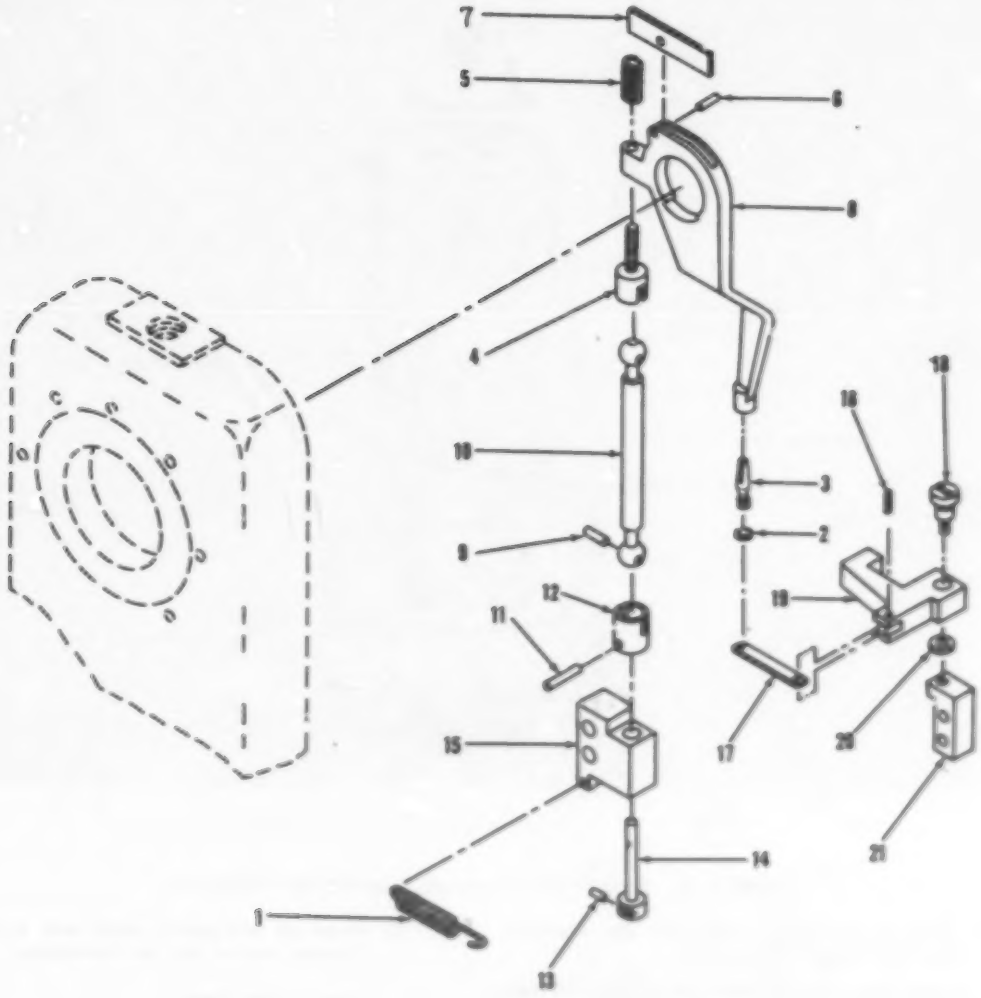
(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the optical plummet in the reverse order of the numerical sequence given in figure 6-31.

g. Installation. Refer to figure 6-30 and install the optical plummet.

6-21. AZIMUTH CENTER AND TANGENT ASSEMBLY.

a. General. The azimuth center and tangent assembly is mounted in the base of the standard. The assembly contains the azimuth circle, electrical slip ring, and the optical plummet objective and pentaprism. The assembly seats in the tribrach and serves as the main support for the theodolite.



1. Spring
2. Lock washer
3. Grooved pin
4. Clamp screw
5. Spring
6. Pin
7. Lever
8. Clamp
9. Set pin
10. Balljoint
11. Pin
12. Bushing
13. Pin
14. Drive
15. Base block
16. Screw
17. Linkage bar
18. Screw
19. Tangent lever
20. Washer
21. Base block

Figure 6-23. Elevation drive system, exploded view.

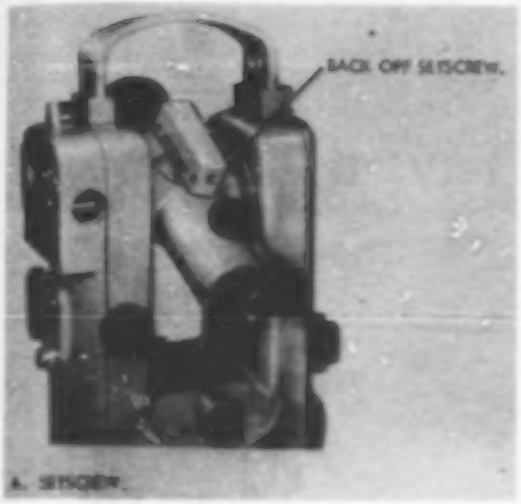


Figure 6-34. Roof prism assembly, removal and installation.

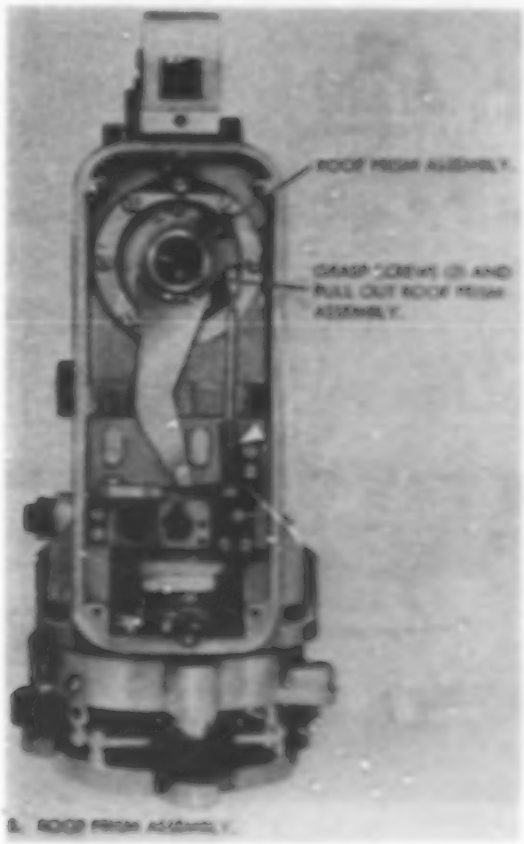
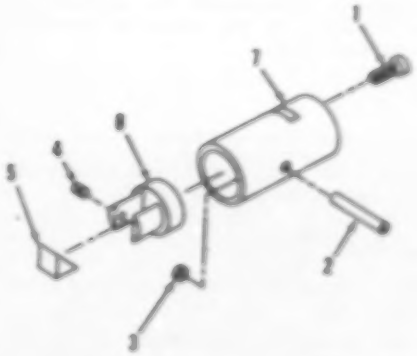


Figure 6-34. Roof prism assembly, removal and installation (cont'd).



1. Screw (2 req)
2. Pin
3. Washer
4. Setscrew
5. Prism
6. Prism mount
7. Adjustable mount

Figure 6-35. Roof prism assembly, exploded view.

b. Disassembly.

(1) Disassemble the azimuth center and tangent assembly in the numerical sequence given in figure 6-32.

(2) Refer to figure 6-30 and remove cover.

(3) Refer to figure 6-32 and remove main center.

c. Cleaning.

(1) Clean the azimuth circle with lens tissue or lens cloth.

(2) Clean all metal parts with an approved cleaning solvent and dry thoroughly.

d. Inspection and Repair.

(1) Inspect azimuth circle for cracks, scratches, chips, and etching.

(2) Inspect electrical contact surfaces for corrosion.

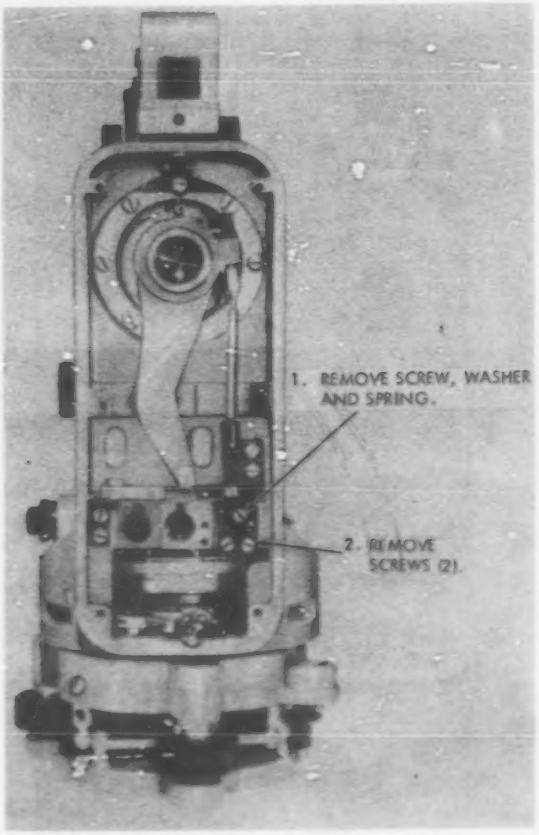


Figure 6-26. Plate level, removal and installation.

(3) Check all metal parts for distortion, cracks, breaks, and burrs. Check condition of all threads.

(4) Remove any burrs. Replace any defective part that cannot be repaired.

e. Reassembly. The azimuth circle and tangent assembly must be reassembled in position in the base of the standard.

(1) Refer to figure 6-33 and install main center.

(2) Refer to figure 6-30 and install cover.

(3) Reassemble remainder of azimuth center and tangent assembly in reverse order of numerical sequence given in figure 6-32.

6-22. TELESCOPE.

a. Telescope eyepiece end.

(1) General. The eyepiece end of the telescope is mounted on the body tube of the telescope. The

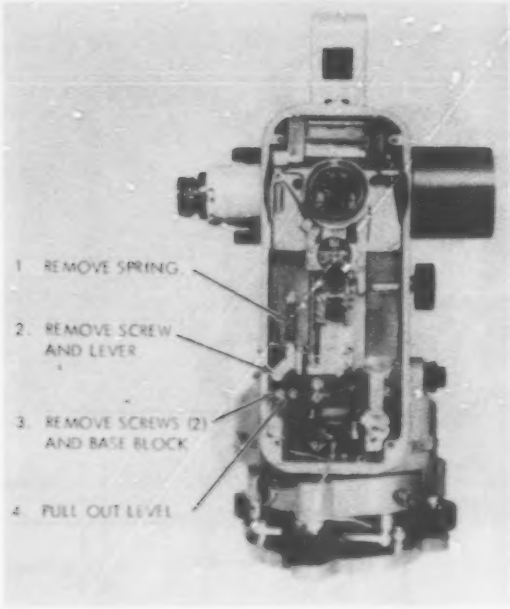


Figure 6-26. Plate level, removal and installation (cont'd).

eyepiece end contains the eyepiece and the objective focusing knob.

(2) Disassembly. Disassemble the eyepiece end of the telescope in the numerical sequence given in figure 6-34.

(3) Cleaning.

(a) Clean lenses with lens tissue or lens cloth.

(b) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

(4) Inspection and Repair.

(a) Inspect lenses for scratches, chips, cracks, and etching.

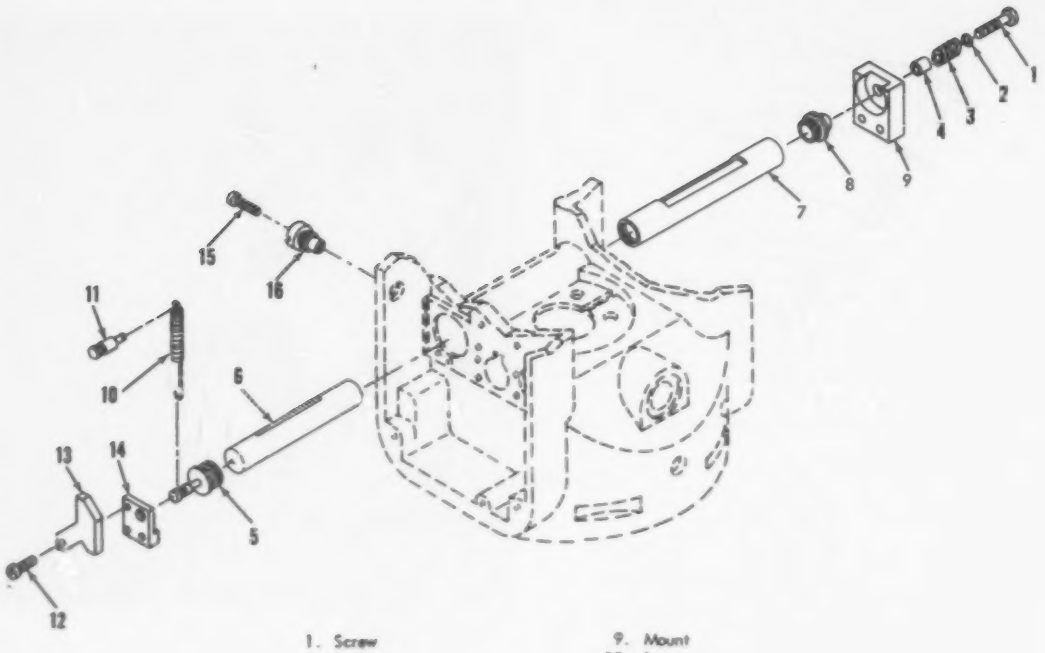
(b) Check all metal parts for distortion, cracks, breaks, and burrs. Check condition of all threads.

(c) Remove all burrs. Replace any defective part that cannot be repaired.

(5) Reassembly. Reassemble the telescope eyepiece end in the reverse order of the numerical sequence given in figure 6-34.

b. Telescope objective end.

(1) General. The telescope objective end is mounted to the body tube of the telescope. The objective end contains the lenses for focusing on the sighted object. Focusing is controlled by two knobs mounted near the eyepiece end.



1. Screw
2. Washer
3. Spring
4. Cover
5. Tube end
6. Level vial
7. Level tube
8. Pin
9. Mount
10. Spring
11. Pin
12. Screw
13. Lever
14. Base block
15. Screw
16. Bushing

Figure 6-27. Plate level, exploded view.

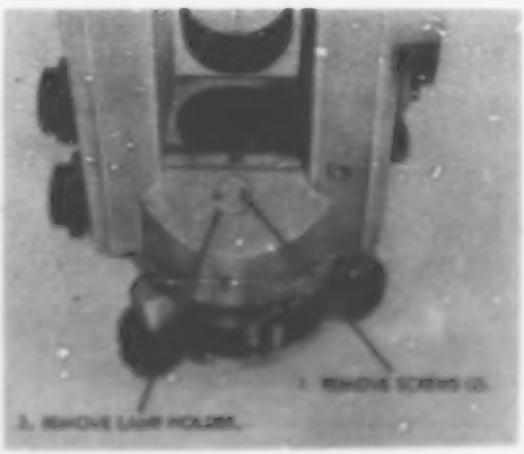


Figure 6-28. Plate level vial illuminator unit assembly, removal and installation.

(2) Disassembly. Disassemble the telescope objective end while it is still installed on the telescope in the numerical sequence given in figure 6-35.

(3) Cleaning.

(a) Clean lenses with lens tissues or lens cloth.

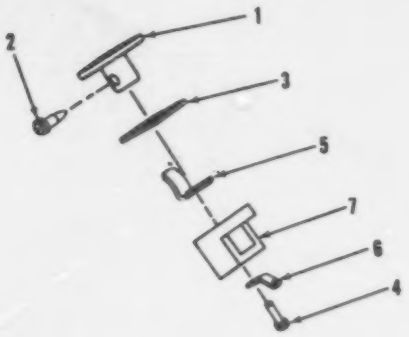
(b) Clean all metal parts with an approved cleaning solvent and dry thoroughly.

(4) Inspection and Repair.

(a) Inspect lenses for chips, scratches, chips, and etching.

(b) Check all non-optical parts for distortion, cracks, breaks, and burrs.

(c) Remove any burrs. Replace any defective part that cannot be repaired.



1. Mount
2. Lamp
3. Packing
4. Rivet
5. Contact
6. Loop
7. Housing

Figure 6-29. Plate Level Vial Illumination Unit Assembly, Exploded View.

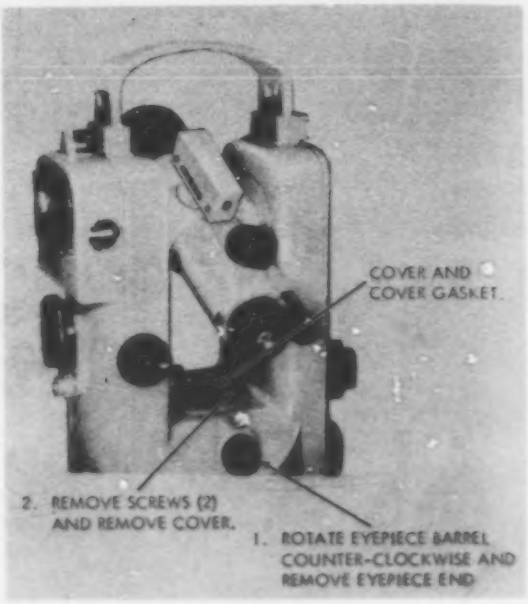

COVER AND COVER GASKET.
2. REMOVE SCREWS (2) AND REMOVE COVER.
1. ROTATE EYEPIECE BARREL COUNTER-CLOCKWISE AND REMOVE EYEPIECE END

Figure 6-30. Optical plummet, removal and installation.

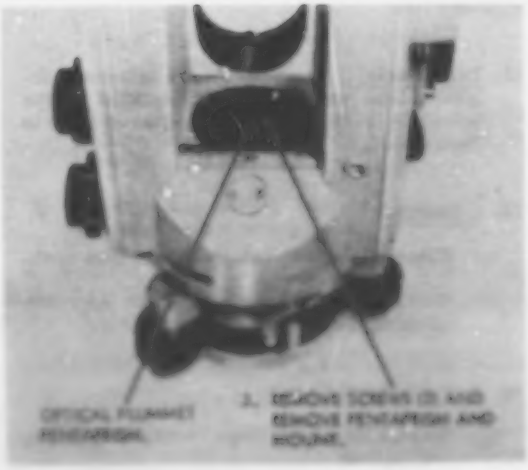
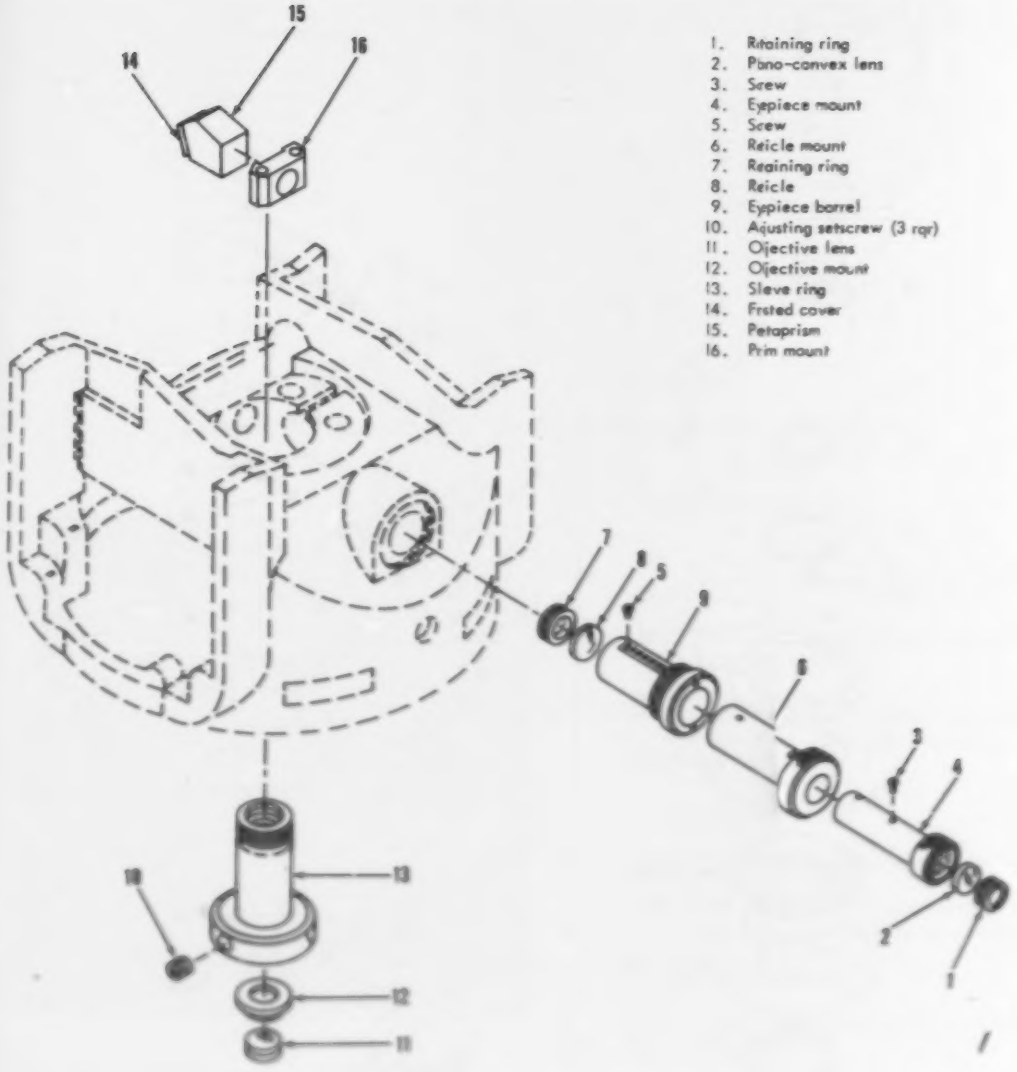


Figure 6-31. Optical plummet, removal and installation (cont'd).

Figure 6-31. Optical plummet, removal and installation (cont'd).



1. Retaining ring
2. Plano-convex lens
3. Screw
4. Eyepiece mount
5. Screw
6. Reticle mount
7. Retaining ring
8. Reticle
9. Eyepiece barrel
10. Adjusting setscrew (3 req)
11. Objective lens
12. Objective mount
13. Sleeve ring
14. Frosted cover
15. Pentaprism
16. Prism mount

Figure 6-11. Optical plummet, exploded view.

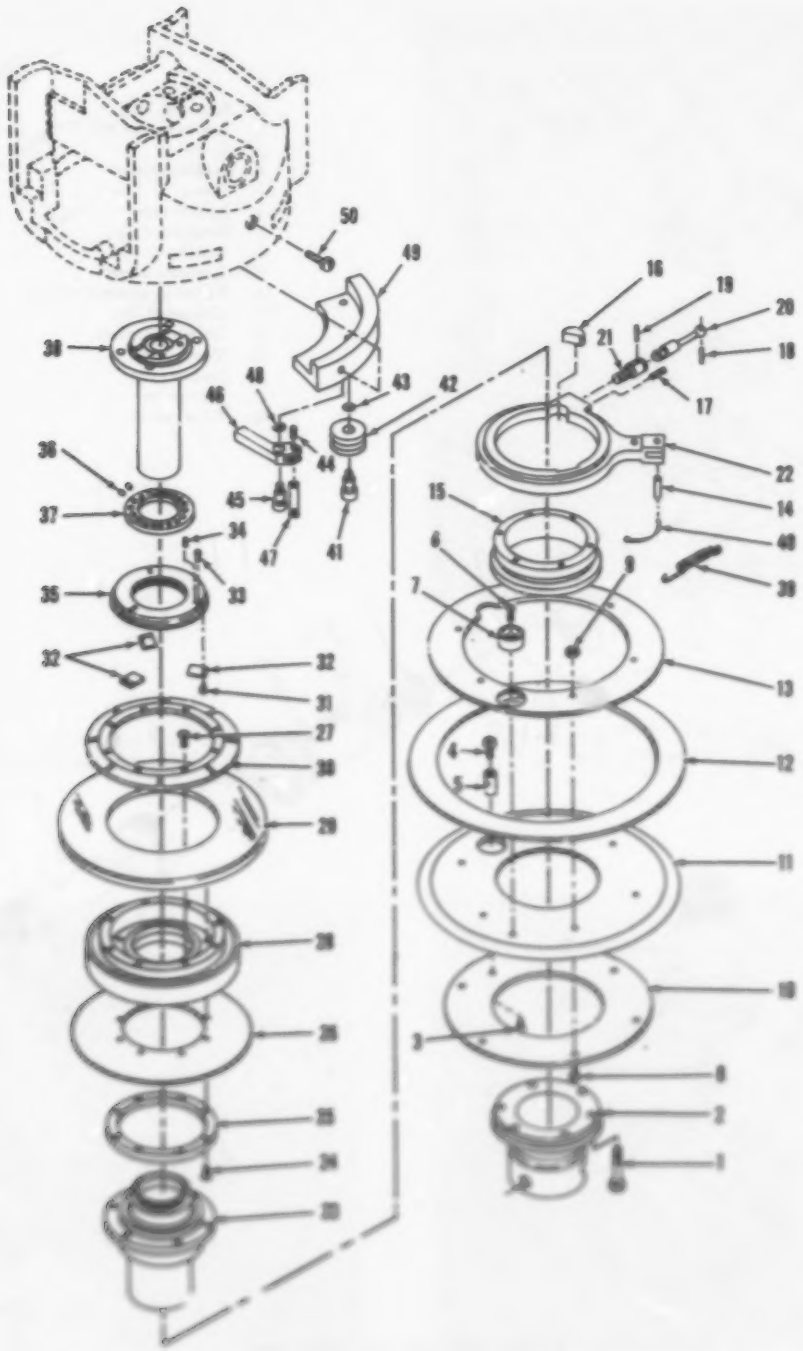


Figure 6-33. Azimuth rotator and tangent assembly, exploded view.

1. Screw (6 rqr)
2. Center stud
3. Screw
4. Screw
5. Connector clamp
6. Screw
7. Bushing
8. Screw (6 rqr)
9. Nut (6 rqr)
10. Slip ring
11. Washer
12. Ring
13. Plate
14. Screw
15. Collar
16. Gib
17. Screw
18. Setscrew
19. Pin
20. Balljoint
21. Clamp screw
22. Clamp ring
23. Main center bearing
24. Screw (8 rqr)
25. Ring
26. Membrane
27. Screw (8 rqr)
28. Circle mount
29. Azimuth circle
30. Clamp plate
31. Screw (6 rqr)
32. Spring washer (3 rqr)
33. Screw (3 rqr)
34. Setscrew (3 rqr)
35. Mounting
36. Ball bearing (24 rqr)
37. Ball bearing race
38. Main center
39. Spring
40. Drawstring
41. Screw
42. Roller
43. Washer
44. Screw
45. Screw
46. Tangent
47. Linkage bar
48. Washer
49. Base block
50. Screw (2 rqr)

Figure 6-32. Azimuth center and tangent assembly, exploded view (cont'd).

Figure 6-33. Main center, removal and installation.

(2) Removal.

(a) Disassemble telescope objective end in the numerical sequence given in figure 6-35.

(b) Refer to figure 6-36 and remove telescope mirror assembly.

(3) Disassembly. Disassemble the mirror assembly in the numerical sequence given in figure 6-37.

(4) Cleaning.

(a) Clean mirror with lens tissue or lens cloth.

(b) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

(5) Inspection and Repair.

(a) Inspect mirror for scratches, chips, cracks, and etching.

(b) Check all metal parts for distortion, cracks, breaks, and burrs.

(c) Remove any burrs. Replace any defective part that cannot be repaired.

(6) Reassembly. Reassemble the mirror assembly in the reverse order of the sequence numbers given in figure 6-37.

(7) Installation.

(a) Refer to figure 6-33 and install the mirror assembly.

(b) Reassemble telescope objective end in the body tube in reverse order of numerical sequence given in figure 6-35.

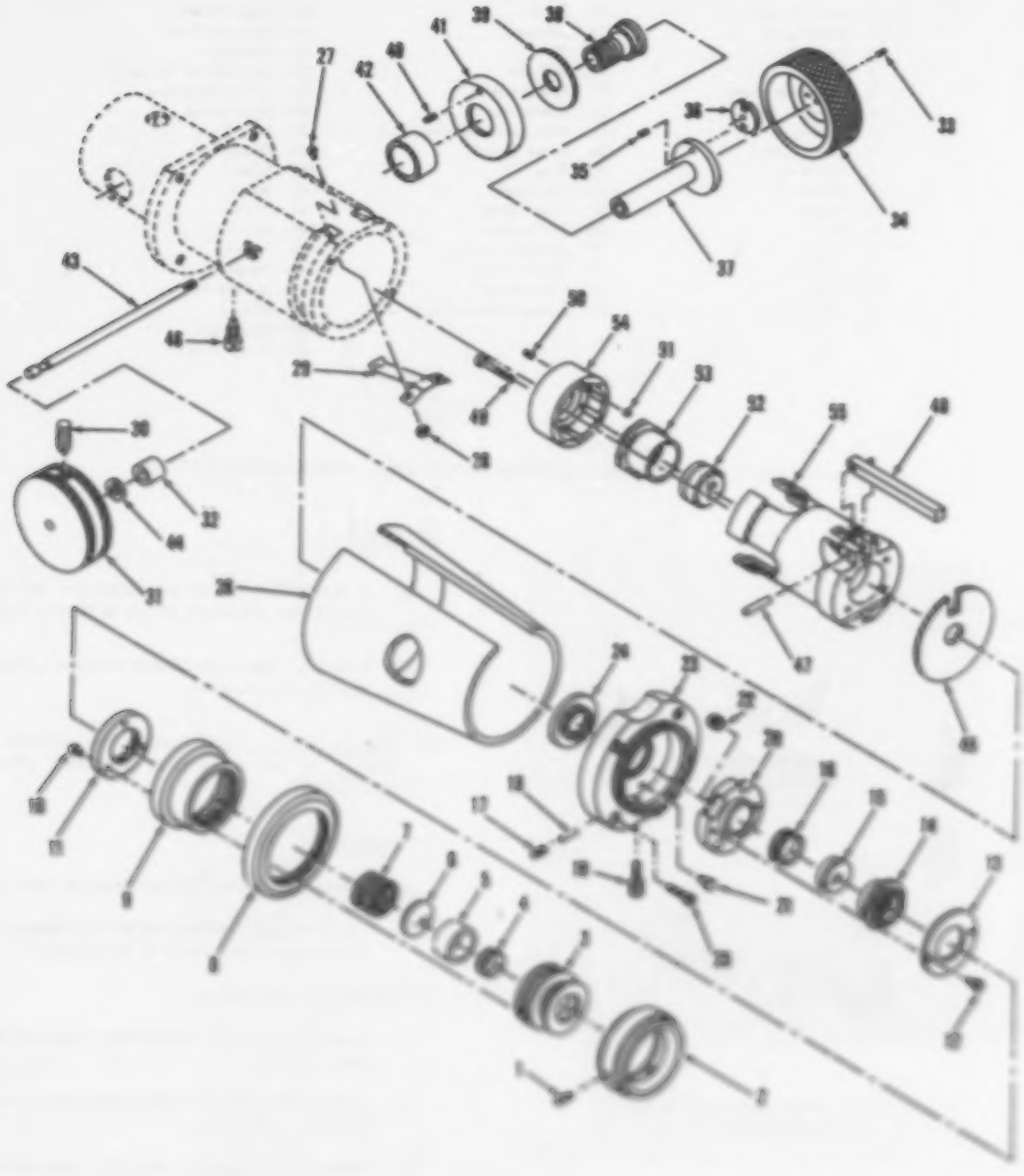


Figure 6-30. [illegible]

1. Setscrew (3 req)
2. End cap
3. Mount
4. Eyepiece lens
5. Spacing ring
6. Field lens
7. Threaded ring
8. Eyepiece ring
9. Support
10. Screw (3 req)
11. Washer
12. Screw (2 req)
13. Plate
14. Reticle mount
15. Reticle
16. Ring
17. Setscrew
18. Gib
19. Adjusting screw
20. Adjusting ring
21. Pin (2 req)
22. Spring
23. Mounting ring
24. Lock ring
25. Screw (4 req)
26. Collar
27. Screw (2 req)
28. Nut (2 req)
29. Leaf Spring
30. Setscrew (2 req)
31. Right knob
32. Spacing ring
33. Set pin
34. Left knob
35. Set pin
36. Washer
37. Pinion
38. Bushing
39. Washer
40. Set pin
41. Ring assembly
42. Spacing ring
43. Spindle
44. Washer
45. Diaphragm
46. Threaded pin
47. Setscrew
48. Rack
49. Screw (4 req)
50. Setscrew (4 req)
51. Ball (4 req)
52. Focusing lens
53. Lens mount
54. Mounting ring
55. Mount

Figure 6-34. Telescope eyepiece end, exploded view (cont'd).

6-33. MICROSCOPE.

a. General. The microscope is mounted adjacent to the telescope. The microscope is used to read the azimuth and elevation circles. The field of the microscope has two windows; the upper reflects the elevation circle image and a reading scale, the lower reflects the azimuth circle image and a reading scale.

b. Removal. Refer to figure 6-38 and remove the microscope.

c. Disassembly. Disassemble the microscope in the numerical sequence given in figure 6-38.

d. Cleaning.

(1) Clean lenses with lens tissue or lens cloth.

(2) Clean all non-optical parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect lenses for chips, scratches, cracks, and etching.

(2) Check non-optical parts for cracks, breaks, distortion, and burrs. Check condition of threads.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the microscope in the reverse order of the numerical sequence given in figure 6-38.

g. Installation. Refer to figure 6-38 and install the microscope.

6-34. COINCIDENCE LEVEL.

a. General. The coincidence level is mounted on the telescope. The level indicates when the telescope line of sight is horizontal.

b. Removal. Refer to figure 6-40 and remove the coincidence level.

c. Disassembly. Disassemble the level in the numerical sequence given in figure 6-41.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

e. Inspection and Repair.

(1) Inspect vial for cracks, etching, and defective bubble.

(2) Check all metal parts for distortion, cracks, breaks, and burrs.

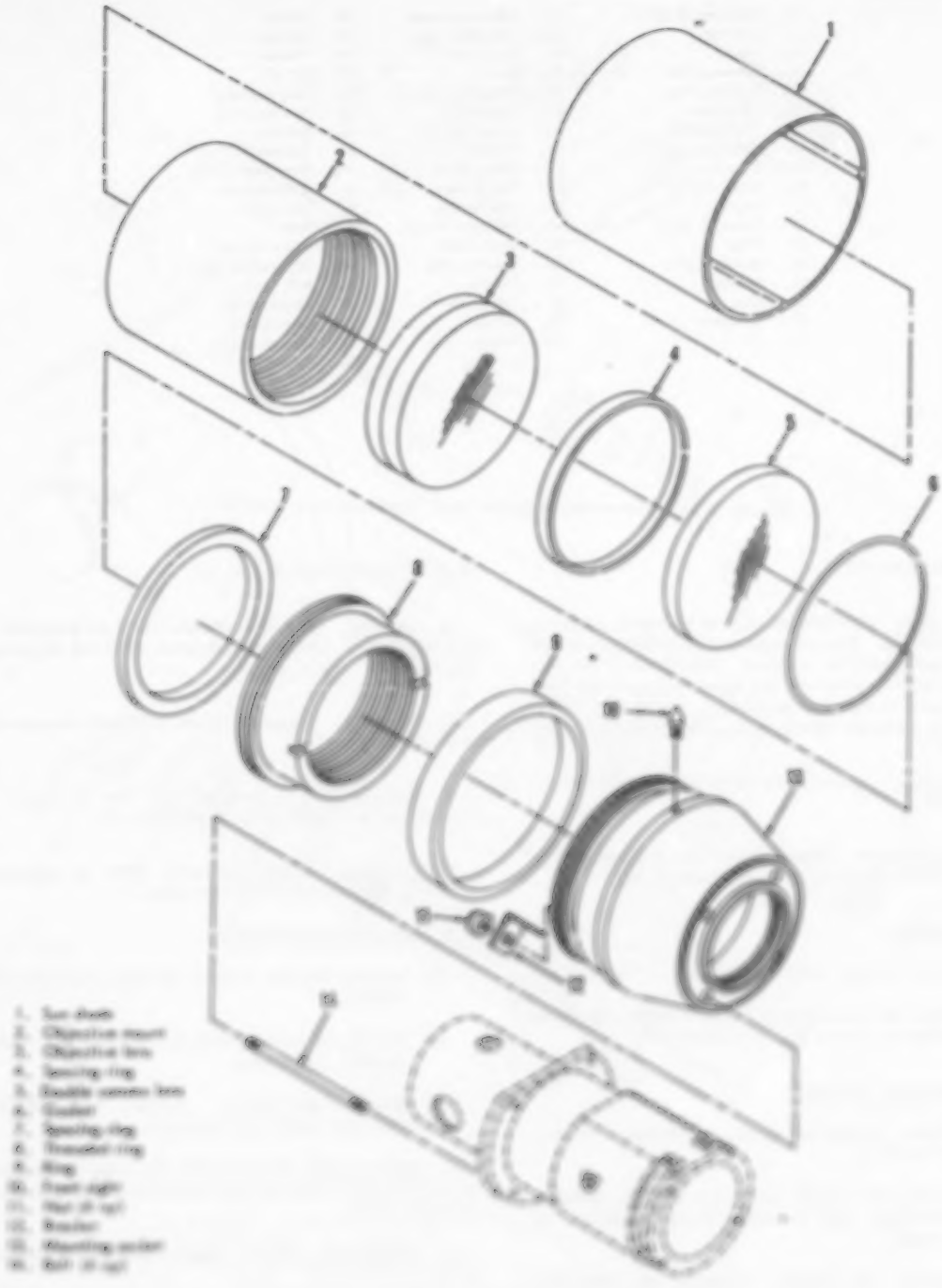
(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the coincidence level in the reverse order of the numerical sequence given in figure 6-41.

g. Installation. Refer to figure 6-40 and install the level.

6-35. [illegible]

a. General. The telescope mounting brackets and body tube are mounted within the left and right standards of the trunnion. The body tube serves as the main mount and axis for the telescope. The mounting brackets serve as the bearings for the axis.



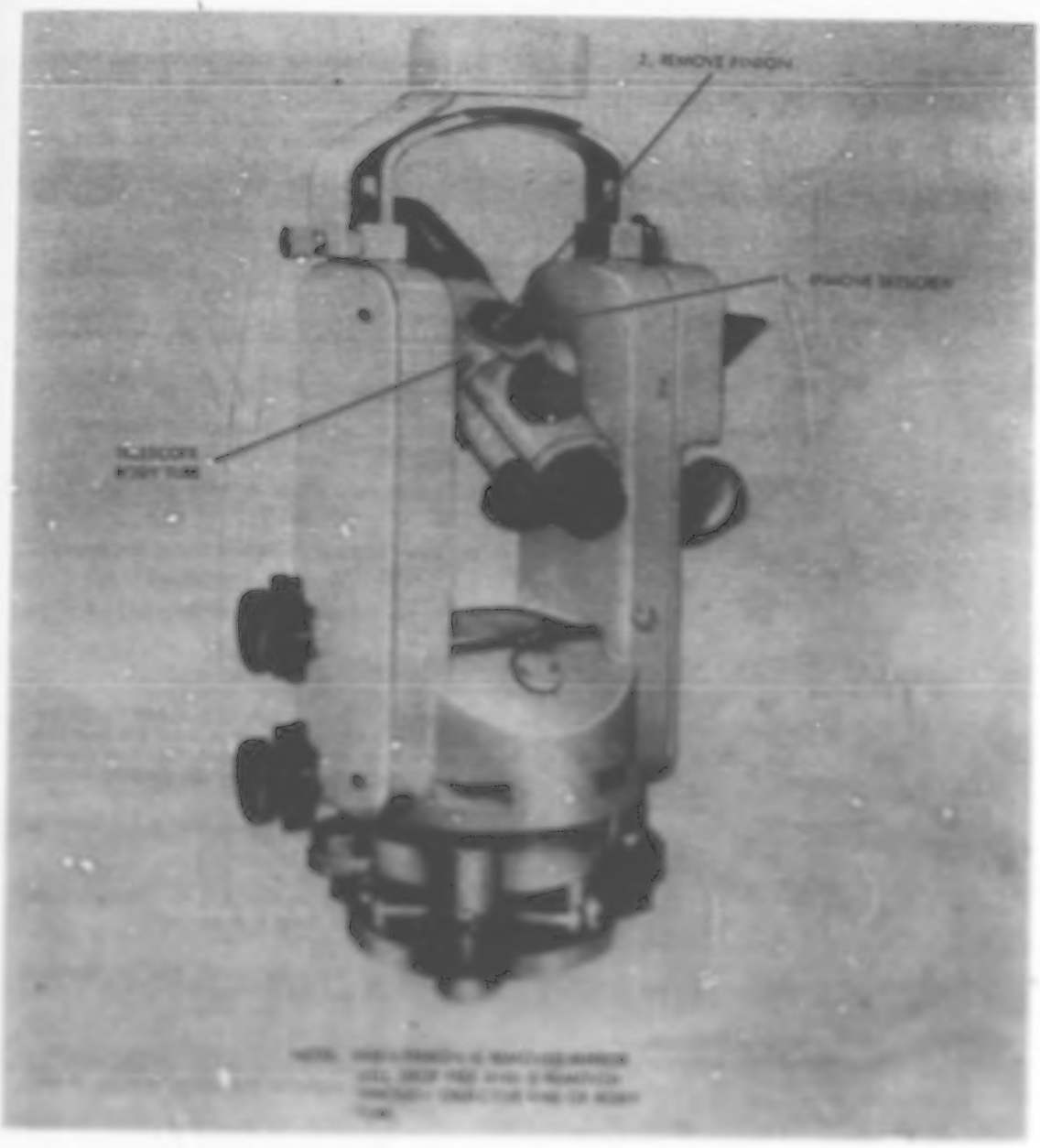


Figure 6-38. [illegible]

b. [illegible]

(1) Remove left elevation sector plate (par. 6-6, a).

(2) Remove right elevation sector plate (par. 6-10, [illegible]

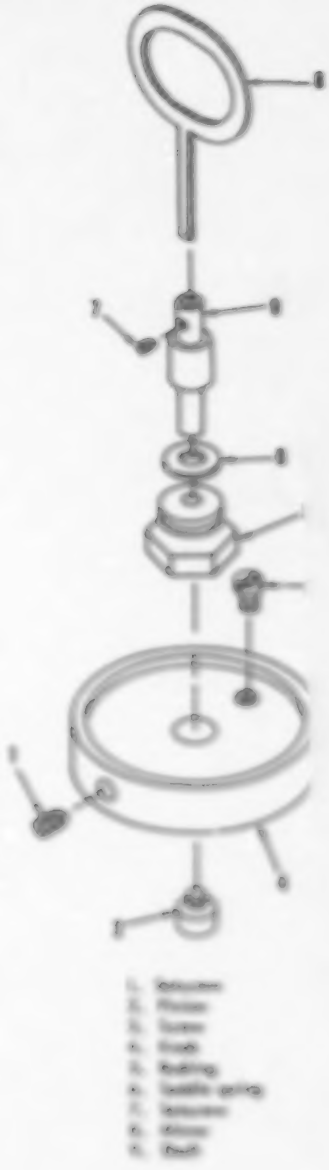


Figure 6-37. Telescope mount assembly, exploded view.

(1) Check all parts for distortion, cracks, breaks, and burrs. Check condition of all threads.

(2) Inspect bearing surfaces of body tube and mounting brackets for scoring or other defects.

(3) Remove any burrs. Replace any defective part that cannot be replaced.

f. Reassembly. Reassembly of the tube and brackets is effected during installation (par. 6-34, g) except that after one bracket is installed, position body tube in bracket before installing the other bracket.

g. Installation.

(1) Refer to figure 6-43 and install right mounting bracket.

(2) Install right standard cover plate (par. 6-11, g).

(3) Refer to figure 6-43 and install left mounting bracket.

(4) Install left standard cover plate (par. 6-8, g).

6-36. TRIBRACH.

a. General. The tribrach is the mount for the theodolite. The tribrach serves to level the theodolite and permit it to be swung in azimuth. The tribrach contains the circular level and the leveling screws.

b. Removal. Refer to figure 3-15 and remove the tribrach.

c. Disassembly. Disassemble the tribrach in the numerical sequence given in figure 6-45.

d. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

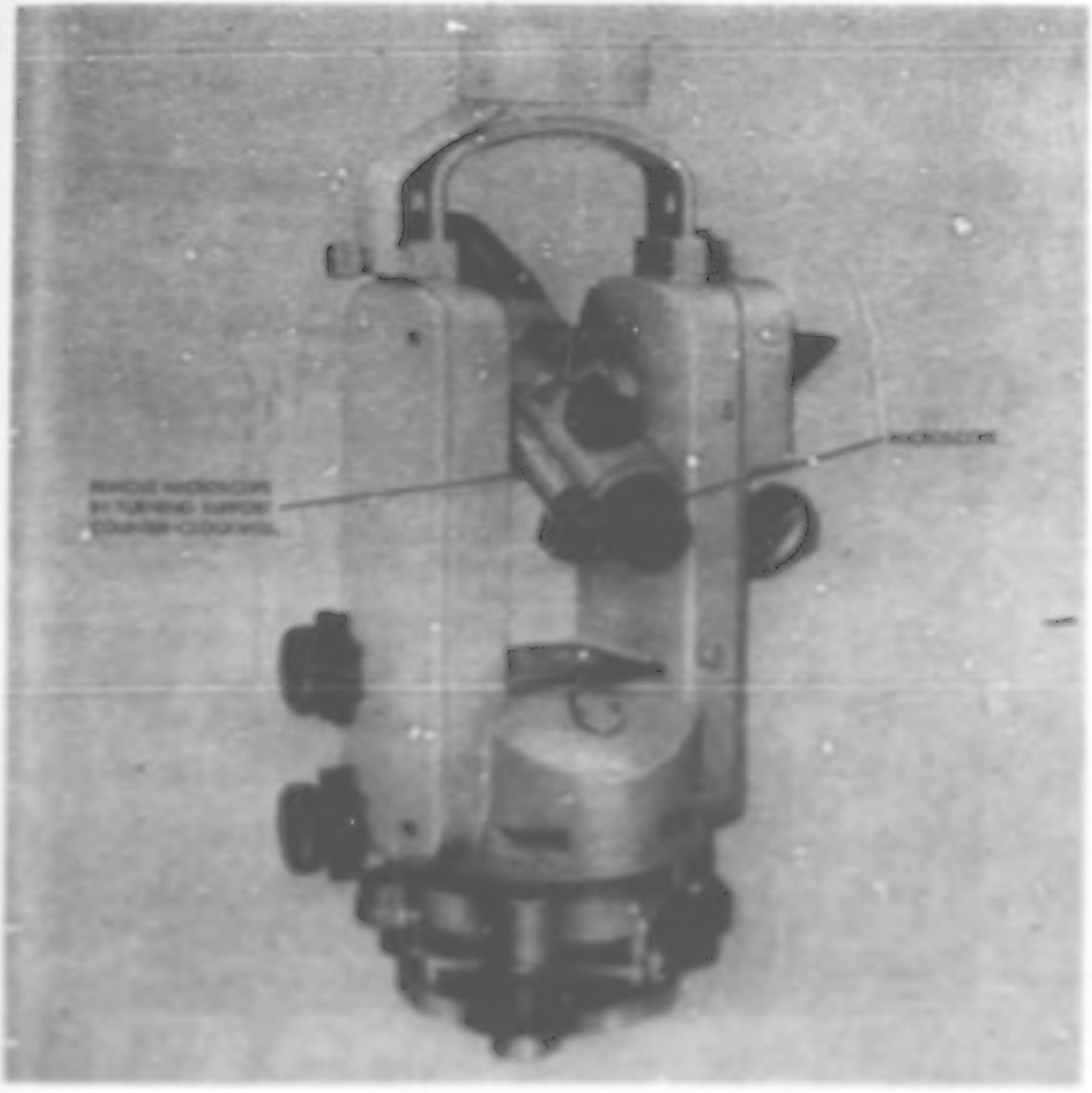
e. Inspection.

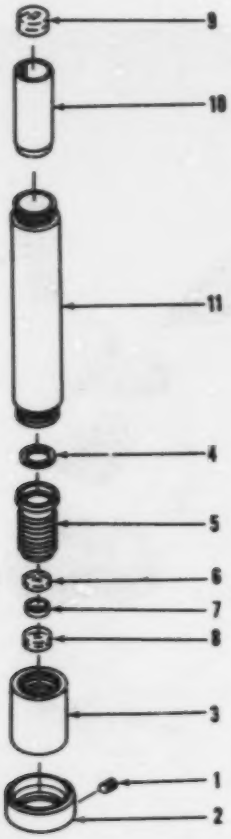
(1) Check all parts for distortion, cracks, breaks, and burrs.

(2) Check condition of all threads. Inspect circular compass glass for cracks and chips.

(3) Remove any burrs. Replace any defective part that cannot be repaired.

f. Reassembly. Reassemble the tribrach in the reverse order of the numerical sequence given in figure 6-45.





1. Setscrew
2. End cap
3. Support
4. Diaphragm
5. Eyepiece mount
6. Plano-convex lens
7. Spacing ring
8. Doublet lens
9. Doublet lens
10. Mount
11. Barrel

Figure 6-39. Microscope, exploded view.

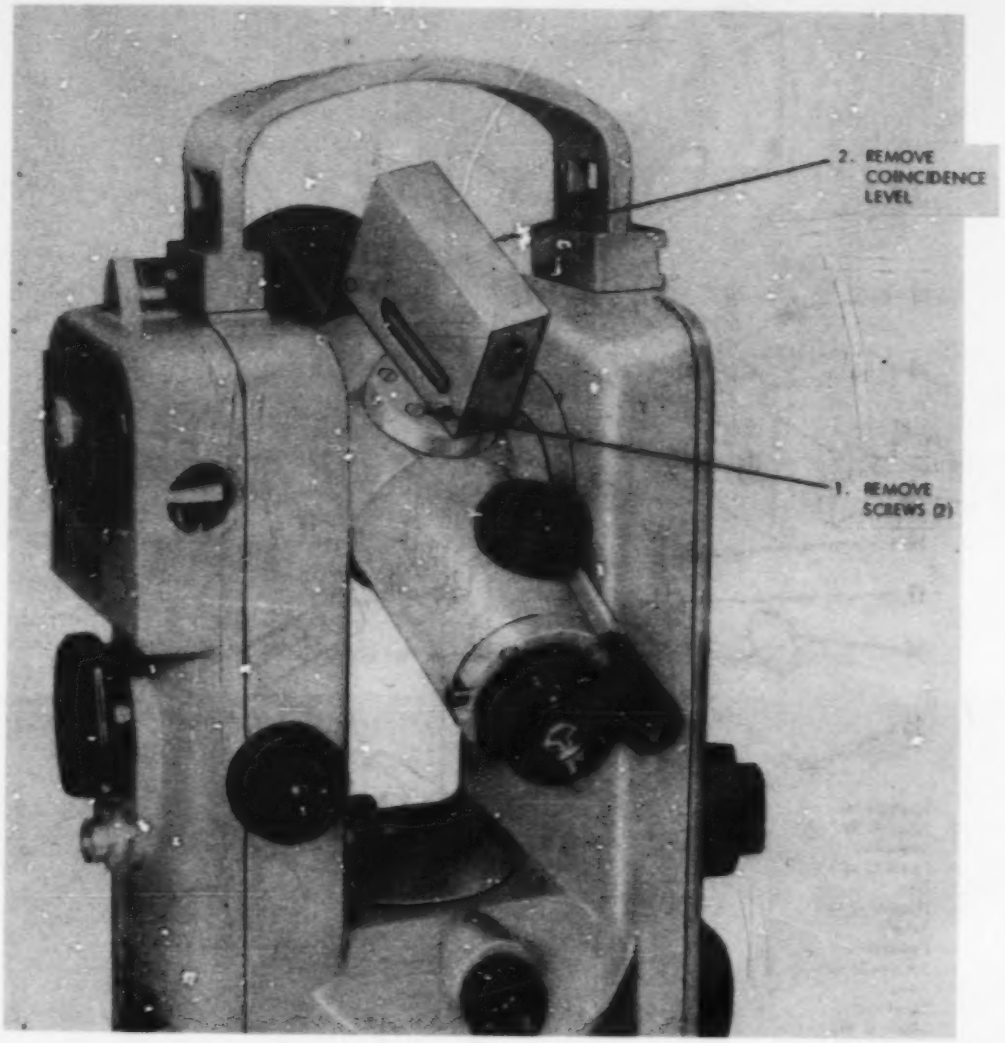


Figure 6-40. Coincidence level, removal and installation.

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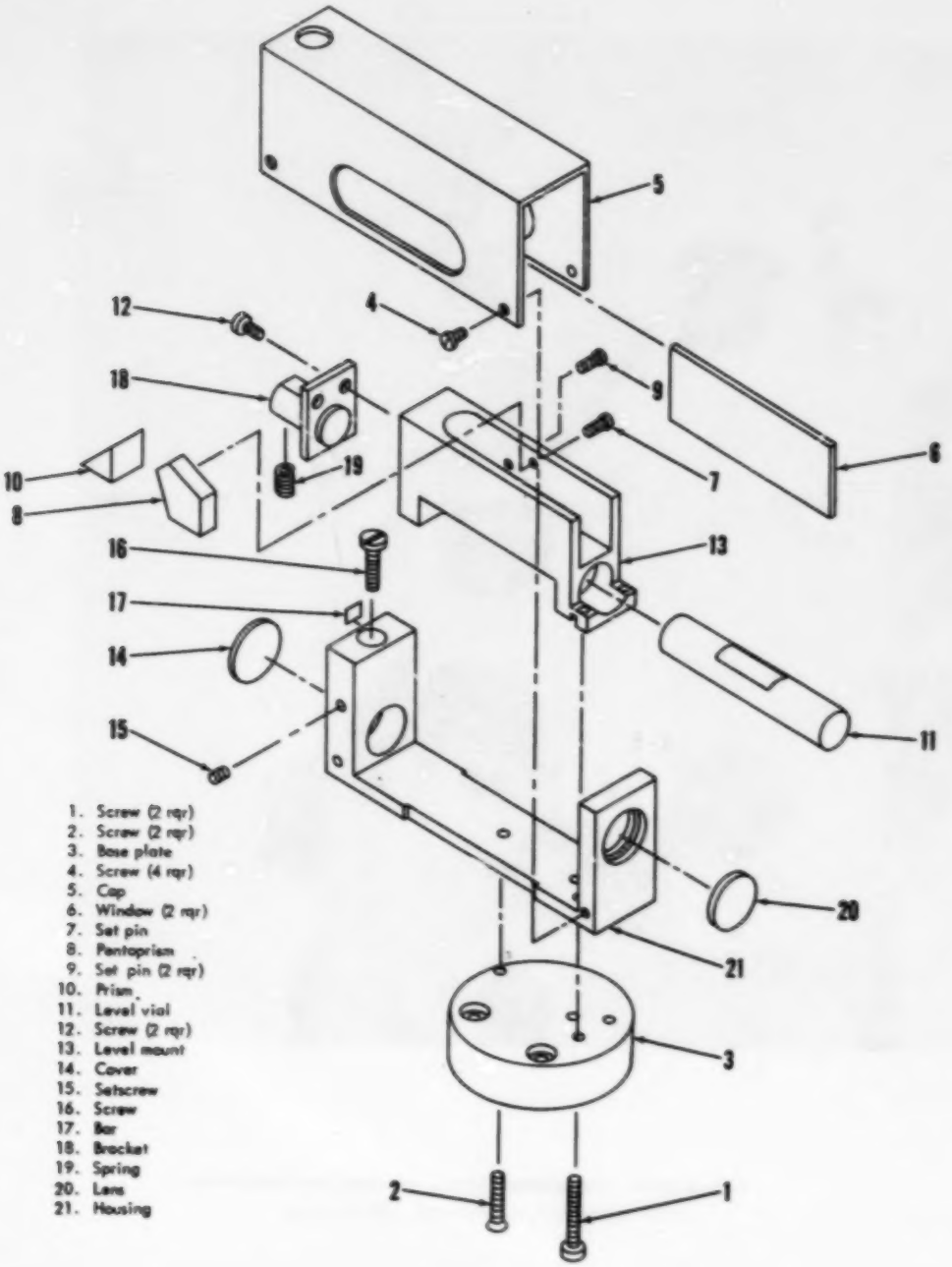


Figure 6-41. Coincidence level, exploded view.

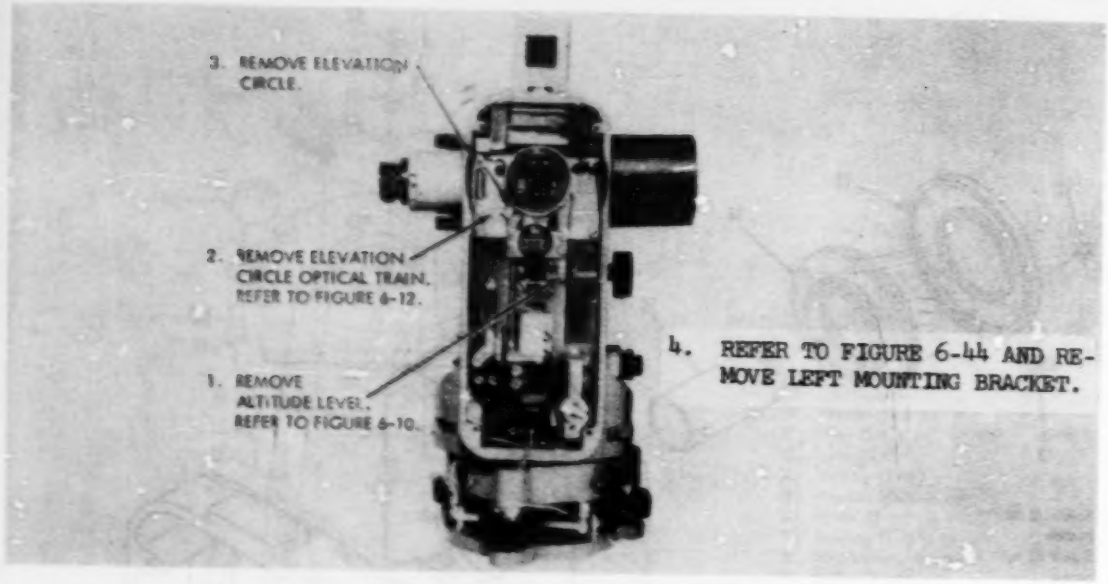

3. REMOVE ELEVATION CIRCLE.
2. REMOVE ELEVATION CIRCLE OPTICAL TRAIN. REFER TO FIGURE 6-12.
1. REMOVE ALTITUDE LEVEL. REFER TO FIGURE 6-10.
4. REFER TO FIGURE 6-44 AND REMOVE LEFT MOUNTING BRACKET.

Figure 6-42. Telescope left mounting bracket, removal and installation.

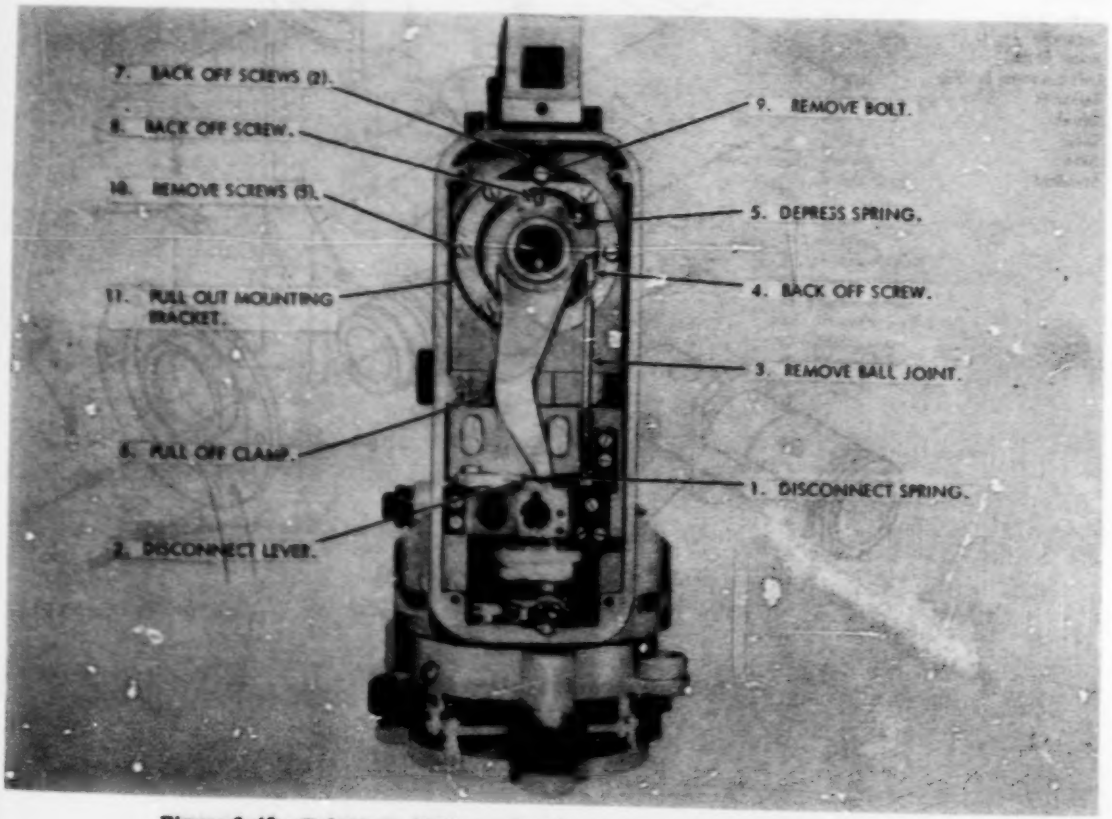


Figure 6-43. Telescope right mounting bracket, removal and installation.

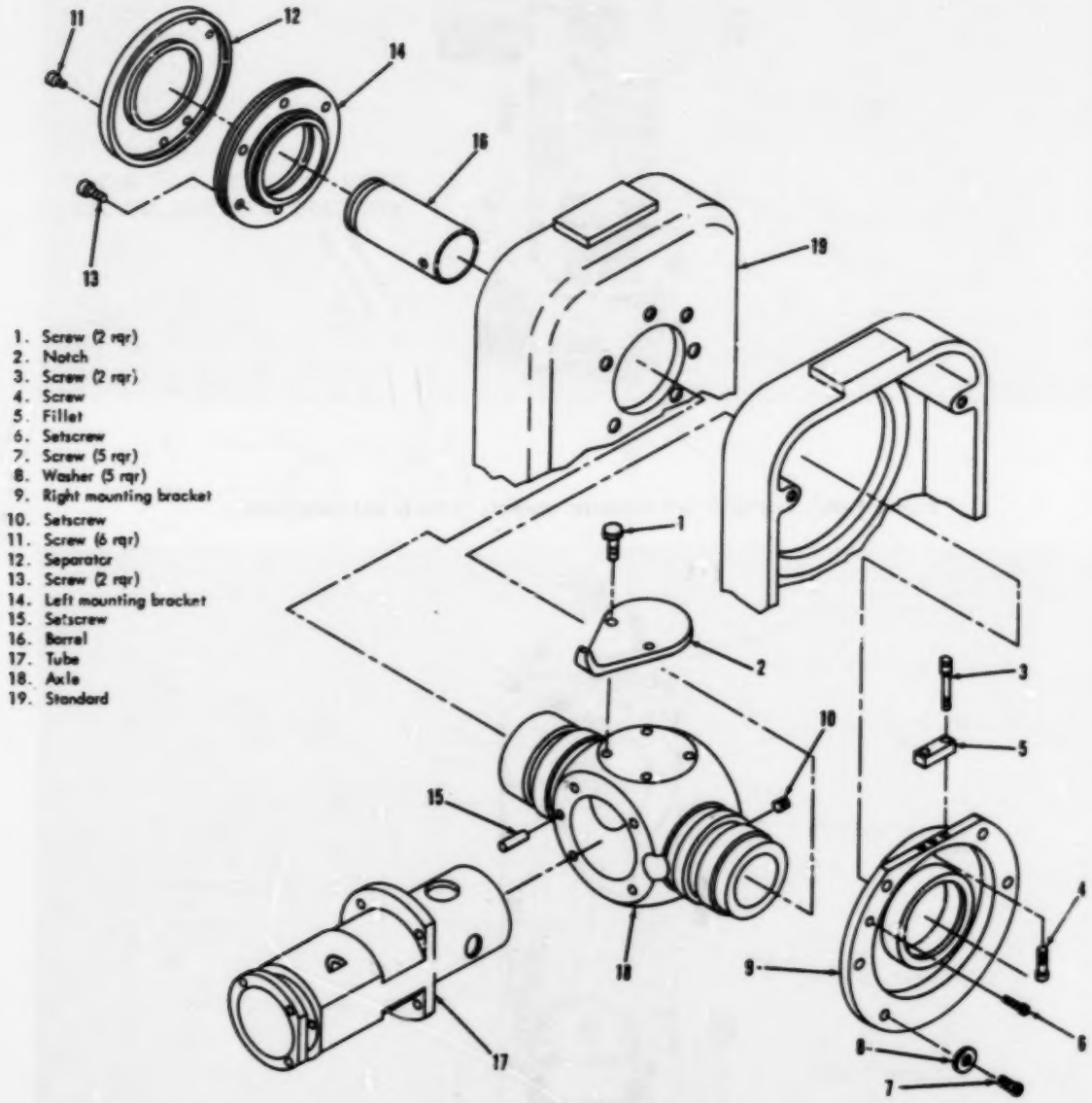
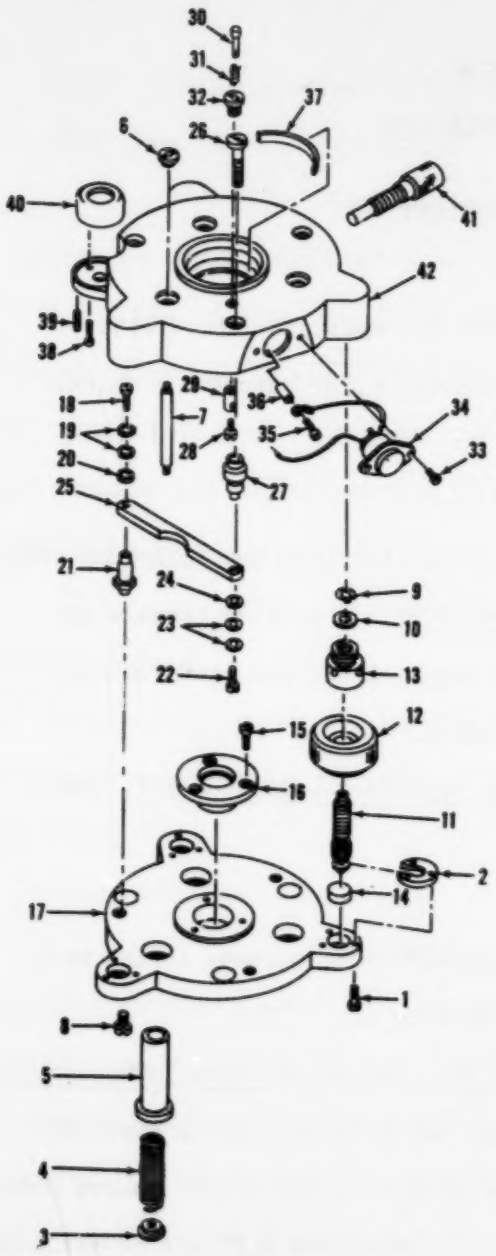


Figure 6-44. Telescope axle, mounting brackets, and body tube, exploded view.



1. Screw (9 rqr)
2. Lock washer (3 rqr)
3. Retaining nut (3 rqr)
4. Spring (3 rqr)
5. Sleeve (3 rqr)
6. Nut (3 rqr)
7. Alignment pin (3 rqr)
8. Screw (3 rqr)
9. Lock washer
10. Washer (3 rqr)
11. Stem (3 rqr)
12. Knob (3 rqr)
13. Bushing (3 rqr)
14. Pressure Plate (3 rqr)
15. Screw (3 rqr)
16. Bushing (3 rqr)
17. Base plate
18. Screw (3 rqr)
19. Spring (6 rqr)
20. Washer (3 rqr)
21. Bearing (3 rqr)
22. Screw (3 rqr)
23. Spring washer (6 rqr)
24. Washer (3 rqr)
25. Lever (3 rqr)
26. Screw (3 rqr)
27. Bearing (3 rqr)
28. Screw
29. Clamp
30. Pin
31. Spring
32. Bushing
33. Screw (2 rqr)
34. Connector
35. Screw
36. Bushing
37. Spring ring
38. Screw (2 rqr)
39. Screw (2 rqr)
40. Circular level
41. Clamp screw
42. Upper plate

Figure 6-45. Tribrach, exploded view.

APPENDIX A

BASIC ISSUE ITEMS LIST

Section 1. INTRODUCTION

A-1. Scope

This appendix lists items which accompany the Theodolite or are required for installation, operation, or operator's maintenance.

A-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items -- Section II. A list of items which accompany the Theodolite or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies -- Section III. Not applicable.

A-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), column 1.

NOTE: Common hardware items known to be readily available in Army supply will be assigned Maintenance Codes only. Source Codes, Recoverability Codes, and Quantity Authorized will not be assigned to this category of items.

(1) Source Code, indicates the selection status and source for the listed item. Source Codes are:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.

(2) Maintenance Code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable.

Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content,

critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number for the item.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Issue, Column 4. This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit Pack, Column 5. This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column 6. This column indicates the quantity of the item used in the functional group.

g. Quantity Furnished With Equipment, Column 7. This column indicates the quantity of an item furnished with the equipment.

h. Quantity Authorized, Column 8. This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

i. Illustration, Column 9. This column is divided as follows:

(1) Figure Number, column 9a. Indicates the figure number of the illustration in which the item is shown.

A-3

(2) Item Number, column 9b. Indicates the callout number used to reference the item in the illustration.

j. Notes, Column 6. This column indicates informative notes keyed to data appearing in a preceding column.

A-4. Federal Supply Code for Manufacturers

Code	Manufacturer
04609	Williams Tool and Machine Co.
33363	Keuffel and Esser

SECTION II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Ref No & Mfr Code / Useable on Code	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY FURN WITH EQUIP	(8) QTY AUTH	(9) ILLUSTRATION (a) FIG NO.	(9) ILLUSTRATION (b) ITEM NO.
		GROUP 31 - BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED 3100 - BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED							
PC	6675-023-5078	BATTERY CASE (33363) 5240-1111	EA		1		1	2-7	
PC	7920-205-0565	BRUSH, DUSTING	EA		1		1	2-6	2
PC	8330-965-1722	CHAMOIS, Leather	EA		1		1	2-6	4
PC	8105-089-8951	COVER, PLASTIC (33363) 1882-09-0012	EA		1		1	2-6	3
PC	6675-023-5086	EYEPIECE ASSEMBLY: Prismatic (33363) 1801-08	EA		1		1	2-6	7
PC	6675-019-0447	FILTER - Eyepiece (33363) 1866-04-02	EA					2-6	8
PC	6675-019-0536	LAMP - Hand (33363) 2759	EA		1		1	2-7	2
PC	6675-019-0442	PIN - Adjusting, Large (33363) 5240-1105	EA		1		1	2-6	12
PC	6675-933-9532	PIN - Adjusting, Small (33363) 5240-1104	EA		1		1	2-6	13

SECTION II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Ref No & Mfr Code / Useable on Code	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY FURN WITH EQUIP	(8) QTY AUTH	(9) ILLUSTRATION (a) FIG NO.	(9) ILLUSTRATION (b) ITEM NO.
PC	5120-078-2849	SCREWDRIVER - Flat blade (33363) 5240-1101	EA		1		1	2-6	1
PC	5120-078-2852	SCREWDRIVER - Jewelers, Large (33363) 5240-1103	EA		1		1	2-6	11
PC	5120-078-2851	SCREWDRIVER - Jewelers, small (33363) 5240-1102	EA		1		1	2-6	10
PC	5120-089-7804	WRENCH - Spanner (33363) 1874-10-05	EA		1		1		
PC	5120-821-9681	WRENCH - Open End (04609) W3434-1	EA		1		1		
		GROUP 32 - BASIC ISSUE ITEMS, TROOP INSTALLED							
		3200 - BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED							
PC	6135-981-1099	BATTERY - Dry	EA		6		*	2-7	1

APPENDIX B

MAINTENANCE ALLOCATION

Section I. MAINTENANCE ALLOCATION

B-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

B-2. EXPLANATION OF COLUMNS IN SECTION II.

a. Group Number. Column 1. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Functional Group. Column 2. This column contains a brief description of the components of each functional group.

c. Maintenance Functions. Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew
O - Organizational maintenance
F - Direct support maintenance
H - General support maintenance
D - Depot maintenance

The maintenance functions are defined as follows:

A - INSPECT. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - TEST. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - SERVICE. To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D - ADJUST. To rectify to the extent necessary to bring into proper operating range.

E - ALIGN. To adjust specified variable elements of an item to bring to optimum performance.

F - CALIBRATE. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - INSTALL. To set up for use in an operational environment such as an emplacement, site, or vehicle.

H - REPLACE. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I - REPAIR. To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J - OVERHAUL. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K - REBUILD. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment. Column 4. This column is provided for referencing by code the special tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

e. Remarks. Column 5. This column is provided for referencing by code the remarks (Section IV) pertinent to the maintenance functions.

B-3. EXPLANATION OF COLUMNS IN SECTION III.

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T&TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal Stock Number of tools and test equipment.

B-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
18	BODY, CAB, HOOD AND HULL													
1808	Carrying Cases:													
	Base, Carrying case								C	O				
	Hood, Carrying case								C	O				
	Transportation case								C	O				
	Knapsack									O				
22	ACCESSORY ITEMS													
2202	Accessory Items:													
	Tool Kit								C	O				
	Plumb bob case								C	O				

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
67	PRECISION INSTRUMENT													
	Theodolite:													
	Alidade assembly		O	C	C				O	D	D			A, B
	Tribach assembly			C					O	D				
6701	Telescope Assembly:													
	Barrel assembly								D	D				
	Telescope			C	C				D	D				C
6702	Optics:													
	Prism assembly			C					D	D				D
	Prisms: porro, viewing angle and degree			C					D					E
	Mount assemblies, Prisms								D					
	Mirror assembly, illumination			C					O	F				F
	Circle, vertical; degree & MIL								D					
	Readout assembly								D	D				
	Illumination assembly, horizontal & vertical								D	D				
	Mount illumination								D					
	Lens and mount assembly								D					
	Microscope assembly lens: eye, field, objective & condensor			C	O				D					G, H
	Eye piece: right angle T and reticle			C					D					I
	Eye piece: optical plumb and compass			O					D					
	Sleeve assembly, prism								O					
	Filters			C										
	Reticle assembly, illumination								D	D				
6703	Mechanical, Structural, and Precision Parts:													
	Prism mounts			D					D	D				J
	Base assembly, azimuth			C					D	D				

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
6703	Mechanical (cont)													
	Cover, porro prism								D					
	Housing assembly, azimuth base								D	D				
	Screw assembly, tangent								D					
	Base assembly, inner								D	D			1	
	Knob assembly, clamp								D	D				
	Clamp assembly, repeating								D	D				
	Standard assembly			C					D	D				K
	Spindle assembly								D	D				
	Cover assembly, altitude level								D	D				
	Bearing shell assembly			C					D	D				
	Eyepiece assembly								D	D				
	Reflector; bearings mounts								D	D				
	Housing; sights								D					
	Box assembly, battery								O	F				
6704	Batteries:													
	Batteries								C					
6705	Fuses and Lamps:													
	Lamps (bulbs)								C					
	Lamp assembly, hand								C	O				
6710	Circuits Components:													
	Rheostat								O					
6711	Controls, Indicators and Special Components:													
	Switch, hand lamp								O					

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
6712	Mounted Connecting Devices:												•	
	Plates; insulators								D					
	Socket; plug assembly								D					
	Contact, battery								D					
6713	Miscellaneous Wiring and Fittings:													
	Cord assembly, extension								C					
	Illumination assembly								O	O				
	Wire, hookup								D					
	Plug assembly, battery box								F					
6718	Compass and Level:													
	Compass assembly			C					O	F				L
	Level assemblies, circular & altitude			D	C				D	D				M
	Compass								O	H				
	Vial assembly, telescope level			C	C				O	D				N, O
	Retainers; housing, springs								D					
	Bearings; sleeves			D					D					
	Dial; knots								D					
6719	Tripods:													
	Tripod Assembly			C					O	O			2	

Section III

SPECIAL TOOL AND TEST EQUIPMENT REQUIREMENTS

REFERENCE CODE	MAINTENANCE LEVEL	NOMENCLATURE	TOOL NUMBER
1-H	D	Wrench: Spanner FSN 5120-089-7804	(33363) 1874-10-05
2-G	O	Wrench: Tripod FSN 5120-821-9681	(04609) W-3434-1

Section IV

SUPPLEMENT INSTRUCTIONS AND NOTES

REFERENCE CODE	REMARKS
A-A	External
B-B	External
C-A	External
D-A	External
E-A	External
F-A	External
G-A	External
H-B	External
I-A	External
J-A	External
K-A	External
L-A	External
M-D	External
N-A	External
O-B	External

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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